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ADVANTEST
R3272 SERIES

CAL ONLY

MP MASTER
MA34888

ADVANTEST

ADVANTEST CORPORATION

R3272

Spectrum Analyzer

Operation Manual

MANUAL NUMBER FOE-8311217E02

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CHAPTER 11

SPECIFICATIONS

This chapter shows specifications for each component of this instrument.

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1. R3272 Specifications

■ Measurement Function

Spectrum, OBW, ACP, Harm

■ Frequency Characteristics

● **Frequency range**

9 kHz to 26.5 GHz
18 GHz to 60 GHz (With external mixer. Tunable up to 325 GHz)

Frequency range	Frequency band	Harmonic mode(N)
9 kHz to 3.1 GHz	0	1
3.0 GHz to 7.5 GHz	1	1
7.4 GHz to 15.4 GHz	2	2
15.2 GHz to 23.3 GHz	3	3
23.0 GHz to 26.5 GHz	4	4

● **Frequency read accuracy**

(Start, Stop, Center frequency, Marker frequency)

± (Frequency reading × Frequency reference accuracy + Span × Span accuracy + 0.15 × Resolution bandwidth + 10 Hz)

● **Marker frequency counter**

Resolution: 1 Hz to 1 kHz

Accuracy (S/N ≧ 25 dB): ± (Marker frequency × Frequency reference accuracy + 5 Hz × N + 1 LSD)

※ LSD : Least Significant Digit

● **Frequency reference accuracy**

$\pm 2 \times 10^{-8}$ /Day
$\pm 1 \times 10^{-7}$ /Year

● **Frequency stability**

Residual FM (Zero span): $< 3\text{Hz} \times N_{P\text{-}P}$ /0.1sec

Drift: Span ≦ 5 MHz, < 20Hz × [Sweep speed(min) × N]
(After 1 hour warm-up)

● **Signal purity noise side band**

Offset	f ≦ 3GHz	f > 3GHz
10 kHz	< -100 dBc/Hz	< (-98 + 20 log N) dBc/Hz
100 kHz	< -110 dBc/Hz	< (-108 + 20 log N) dBc/Hz

● **Frequency span**

Linear span

Range: 2 kHz to 26.5 GHz, Zero span

Accuracy: ± 4 % (Span > 5 MHz)
± 1 % (Span ≦ 5 MHz)

- **Resolution bandwidth (3dB)**
  - Range: 300 Hz to 3 MHz, 5 MHz (1, 3, 10 sequence)
  - Accuracy: ±20 % (Resolution bandwidth 1 kHz to 1 MHz)
    ±30 % (Resolution bandwidth 300 Hz, 3 MHz, 5 MHz)
  - Selectivity: < 15:1 (300 Hz to 5 MHz)
- **Video bandwidth**
  - Range: 1 Hz to 3 MHz, 5 MHz (1, 3, 10 sequence)
- **Frequency Sweep**
  - Sweep time: 50 ms to 1000s
  - Accuracy: ±5 %
  - Sweep trigger: Free run, Line, Single, Video, External
  - Trace / sec: 10 times

Amplitude Range

- **Measurement range**: +30 dBm to Average indicated noise level
- **Maximum safe input**
  - Average continuous power: ±30dBm (1W) (Input ATT≧10 dB)
  - DC input: 0 V
- **Display range**: 10 × 10 Div
  - Logarithmic: 10, 5, 2, 1, 0.5 dB/Div
  - Linear: (10% of the reference level)/Div
- **Reference level range**
  - Logarithmic: -105 dBm to +60 dBm (0.1 dB step)
  - Linear: 1.25μ V to 223 V (approx. 1 % step of the full scale)
- **Input attenuator range**: 0 to 70 dB (10 dB step)

Dynamic Range

- **Average display noise level**

Frequency range	Frequency band	Noise level
10 kHz	0	-70 dBm
100 kHz	0	-80dBm
1 MHz to 3.1 GHz	0	-{115-1.55×f(GHz)} dBm
3.0 GHz to 7.5 GHz	1	-110 dBm
7.4 GHz to 15.4 GHz	2	-103 dBm
15.2 GHz to 23.3 GHz	3	-96 dBm
23.0 GHz to 26.5 GHz	4	-90 dBm

(Resolution bandwidth : 1 kHz, Input attenuator : 0dB, Video bandwidth : 1 Hz)

● **1dB gain compression**

Frequency range	Mixer input level
>10 MHz	-5 dBm

● **Spurious response**

Second harmonic distortion

Frequency range	Second harmonic distortion	Mixer level
10 MHz to 3.0 GHz	<-70 dBc	-30 dBm
> 3.0 GHz	<-100 dBc	-10 dBm

Third-Order intermodulation distortion

Frequency range	Third-Order intermodulation distortion	Mixer level
10 MHz to 3.0 GHz	<-75 dBc	-30 dBm
> 3.0 GHz	<-75 dBc	-30 dBm

(12.5 kHz Separation, Resolution bandwidth : 300 Hz)

Image/Multiple/Out-of-Band response

Frequency range	Image/Multiple/Out-of-Band response
10 MHz to 18 GHz	<-70 dBc
10 MHz to 23 GHz	<-60 dBc
10 MHz to 26.5 GHz	<-50 dBc

Residual response

Frequency range	Residual response
1 MHz to 3.0 GHz	<-100 dBm
300 kHz to 26.5 GHz	<-90 dBm

(No input signal, Input ATT 0dB, 50Ω terminate)

Amplitude Accuracy

Frequency response
Flatness within the band

Frequency range	Flatness within the band	Frequency band
1 kHz to 3.1 GHz	±1.5 dB	0
50 MHz to 3.1 GHz	±1.0 dB	0
3.0 GHz to 7.5 GHz	±1.5 dB	1
7.4 GHz to 15.4 GHz	±3.5 dB	2
15.4 GHz to 23.3 GHz	±4.0 dB	3
23.0 GHz to 26.5 GHz	±4.0 dB	4

(Input ATT 10dB)

Additional error due to band switching

Frequency range	Additional error
9 kHz to 26.5 GHz	±5 dB

(Calibration signal as the reference)

Calibration signal accuracy(30 MHz)
-10 dBm ±0.3 dBm

IF gain error (After self-calibration)

	Temperature range	IF gain error
0 dBm to -50 dBm	15 °C to 35 °C	±0.5 dB
	0 °C to 50 °C	±0.6 dB

Scale indication accuracy (After self calibration)

Temperature range	Logarithmic	Linear
15 °C to 35 °C	±0.2 dB/1 dB ±1 dB/10 dB ±1.5 dB/80 dB	±15% of reference level (Within 8 Div)
0 °C to 50 °C	±0.3 dB/1 dB ±1.2 dB/10 dB ±1.5 dB/80 dB	±20% of reference level (Within 8 Div)

● **Input attenuator switching error**

Frequency range	switching error
0 Hz to 12.4 GHz	±1.1 dB / 10 dB Step, Max. 2.0 dB
12.4 GHz to 18.0 GHz	±1.3 dB / 10 dB Step, Max. 2.5 dB
18.0 GHz to 26.5 GHz	±1.8 dB / 10 dB Step, Max. 3.5 dB

(10 dB as the reference ; at 20 to 70 dB)

● **Resolution bandwidth switching error**

Temperature range	switching error
15 °C to 35 °C	≦ ±0.3 dB
0 °C to 50 °C	≦ ±0.5 dB

(Resolution bandwidth: 300 kHz reference, after self-calibration, 3 × Resolution bandwidth ≧ Span, 300 Hz to 3 MHz)

● **Pulse quantization error** (In pulse measurement mode, PRF > 500/Sweep time)

Logarithmic
1.2 dB (Resolution bandwidth ≦ 1 MHz)
3 dB (Resolution bandwidth = 3 MHz)

Linear
4% of the reference level (Resolution bandwidth ≦ 1 MHz)
12% of the reference level (Resolution bandwidth = 3 MHz)

■ Analog Demodulation

● **Spectrum demodulation**

Modulation type	AM, FM
Audio output	Internal speaker, earphone jack, sound volume adjustable
Demodulation duration	100ms to 1000s

■ Input/Output

● **RF input**

Connector	N-type female(Can be converted to SMA type.), Front Panel
Impedance	50 Ω (nominal)
VSWR	(Frequency setting input ATT ≧ 10 dB) < 1.5 : 1 (≦ 3 GHz) (nominal) < 2.5 : 1 (> 3 GHz) (nominal)

● **1st LO output**

Connector	SMA female, Front panel
Impedance	50 Ω (nominal)
Frequency	3.421 MHz to 7.921 GHz
Amplitude	> +5 dBm

Calibration signal output

Connector	BNC female, Front panel
Frequency	30 MHz × (1 ± Frequency reference accuracy)
Impedance	50 Ω (nominal)
Amplitude	-10 dBm ± 0.3 dB

10MHz frequency reference input/output

Connector	BNC female, Rear panel
Output impedance	50 Ω (nominal)
Output frequency accuracy	10MHz × Frequency reference accuracy
Input/output amplitude range	-5 dBm to +5 dBm

21.4MHz IF output

Connector	BNC female, Rear panel
Impedance	50 Ω (nominal)

421MHz IF output

Connector	BNC female, Rear panel
Impedance	50 Ω (nominal)

Video output

Connector	VGA(15 pin, female), Rear panel 640 × 480 dot VGA equivalent

X axis output

Connector	BNC female, Rear panel
Impedance	1 kΩ (nominal), DC connection
Amplitude	approx. -5 V to +5 V

Y axis output

Connector	BNC female, Rear panel
Impedance	220 Ω (nominal)
Amplitude	approx. 2 V in full scale (10dB/DIV) maximum approx. -3V to 5V

Z axis output

Connector	BNC female, Rear panel
Amplitude	TTL level
During sweep	High level
Blanking	Low level

External trigger input

Connector	BNC female, Rear panel
Impedance	10 kΩ (nominal), DC connection
Trigger level	TTL level

Gate input

Connector	BNC female, Rear panel
Impedance	10 kΩ (nominal)
Sweep stop	During low mode at TTL level
Sweep	During high mode at TTL level

- **Voice output(Demodulation audio)**
  - Connector: Small-size monophonic jack, Front panel
  - Power output: Maximum 0.2 W, 8 Ω (nominal)
- **Plobe power**
  - Voltage: 4 pin connector, Front panel
  - Current: +12.6V, -12.6V
  - Max. 100mA each
- **I/O**
  - GPIB: IEEE-488, bus connector, Rear panel
  - RS-232: D-SUB 9 pin, Rear panel
  - P-I/O: D-SUB 25 pin, Rear panel
  - EXT-KEY: DIN, Front panel
- **Direct print**: Output with 'ESC/P' or 'HP PCL' command
- **Memory card**
  - Connector: 2 slots, Front panel
  - JEIDA-Ver 4.0 / PCMCIA 2.0 or more
- **Program loader**: Option

General Specifications

- **Temperature and humidity**
  - During operation: 0°C to 50°C
  - When stored: -20°C to 60°C
  - Relative Humidity: 85% or below
- **Power source**
  - During 100VAC operation
    - Rated Voltage: 100 V to 120 V
    - Power consumption: 300 VA or below
    - Frequency: 50 Hz/60 Hz
  - During 220VAC operation
    - Rated Voltage: 220 V to 240 V
    - Power consumption: 300 VA or below
    - Frequency: 50 Hz/60 Hz
- **Mass**: 16.5 kg or below (Excluding optional blocks, front cover, and accessories)
- **Dimensions**: Approx. 177 mm (Height) × 350 mm (Width) × 420 mm (Depth (Excluding the handle, feet and front cover)

CHAPTER 3

Fundamental Operation

This chapter explains the fundamental operation for those who use this instrument for the first time.

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2. Operation keys 3-5
3. Annotation on the screen 3-9
4. Calibration 3-10
5. Measuring the power level 3-11
6. Measurement of Frequency 3-15
7. Dynamic Range and Sweep Rate 3-22

4. Calibration

To execute measurement at specified accuracy, warm up the instrument for more than 60 minutes after the power has been turned on.

1 **Connect the N-BNC adapter to the INPUT connector on the front panel.**

2 **Connect CAL OUT and INPUT connectors on the front panel with the BNC cable (MC-61).**

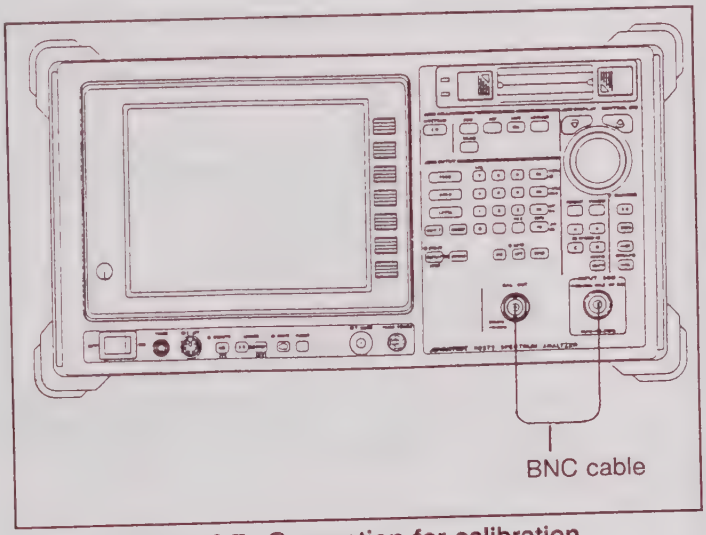

Figure 3-7 Connection for calibration

3 **Press** SHIFT , CAL **7** **and** CAL All **keys to execute calibration.**

It takes approximately 8 minutes until calibration is completed.

CAUTION !

Sometimes, there is a noise of switching in the instrument on executing the calibration. This is the noise that switches the RF attenuator.

5. Measuring the power level

1 Press [SHIFT] and [PRESET] keys to reset to initial setting.

2 Connect the N-BNC adapter to the INPUT connector on the front panel.

3 Connect CAL OUT and INPUT connectors on the front panel with the BNC cable (MC-61).

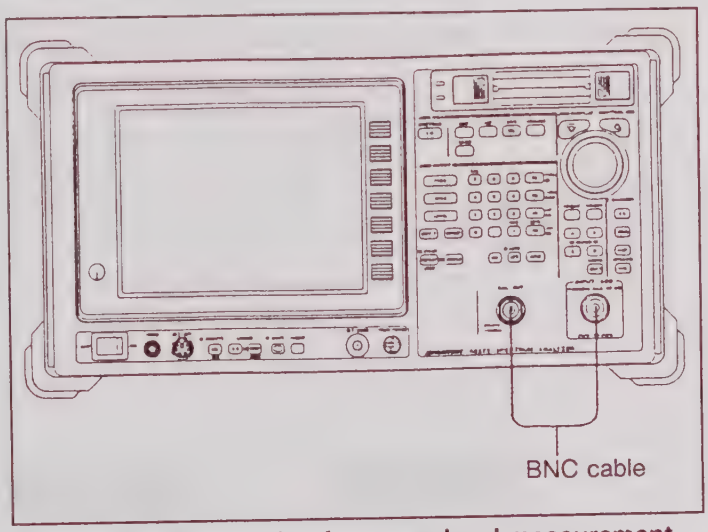

Figure 3-8 Connection for power level measurement

4 Press [LEVEL], [0] and [GHz / +dBm / sec] keys to set reference level to 0 dBm.

5 Press [FREQ], [3], [0] and [MHz] keys to set center frequency to 30 MHz.

6 **Press** SPAN , 5 **and** MHz **keys to set frequency span to 5 MHz.**

7 **Press** SRCH **key to display a marker at the maximum level on the screen.**

The level at marker position is displayed at upper right on the screen.

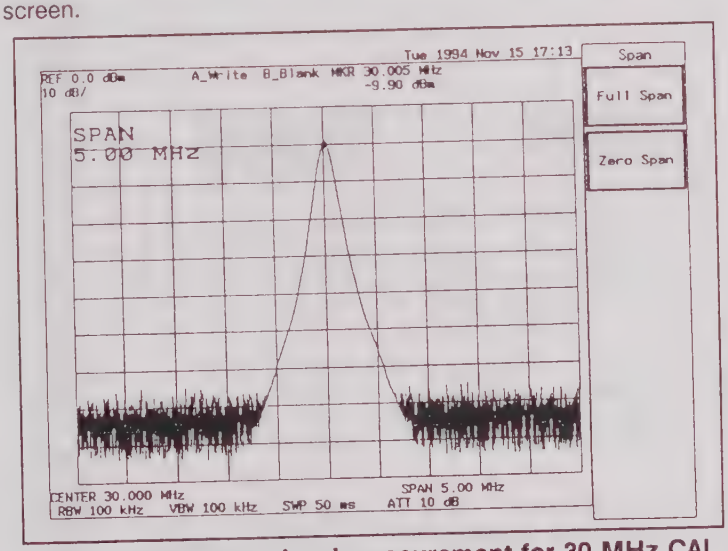

Figure 3-9 Power level measurement for 30 MHz CAL signal

● Power level measurement by increased display resolution

1 Press [⇒RL] key to set marker level to reference level.

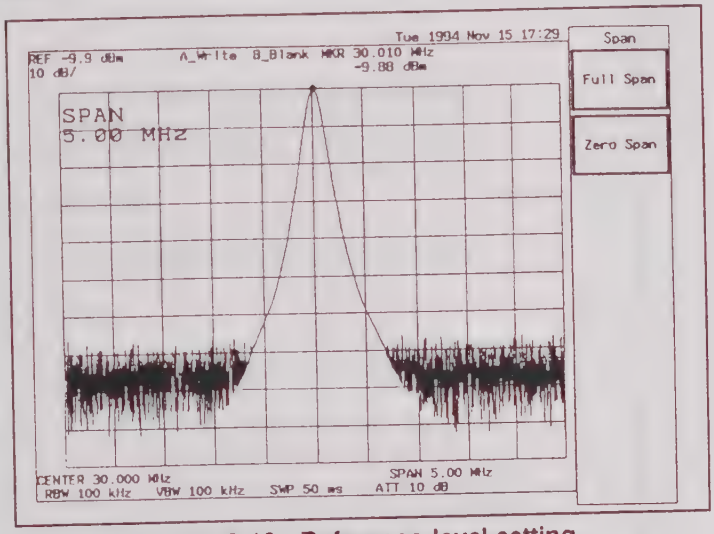

Figure 3-10 Reference level setting

2 Press [LEVEL], [dB/div] and [1dB/div] keys.

3 Press [SPAN], [1] and [MHz] keys to set frequency span to 1 MHz.

4 Press [BW], [RBW] [AUTO] [MNL], [3], [0], [0] and [kHz] keys to set RBW to 300 kHz.

5 Press [VBW] [AUTO] [MNL], [3], [0] and [kHz] keys to set VBW to 30 kHz.

In the case that the displayed level is changed by the changing of RBW at this time, press [⇒RL] again to set to the reference level.

6 **Press [SRCH] key to display a marker at the maximum level on the screen.**

The power level at the marker position is displayed at upper right on the screen.

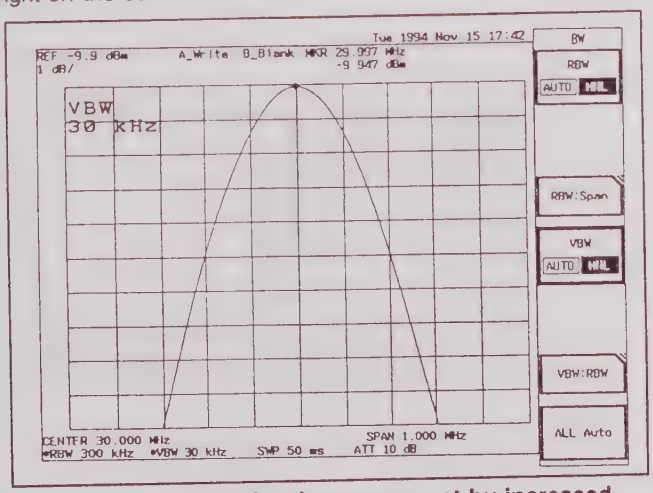

Figure 3-11 Power level measurement by increased display resolution

6. Measurement of Frequency

■ Measurement with normal marker

1 Press [SHIFT] and [PRESET] keys to reset to initial setting.

2 Connect the N-BNC adapter to the INPUT connector on the front panel.

3 Connect CAL OUT and INPUT connectors on the front panel with the BNC cable (MC-61).

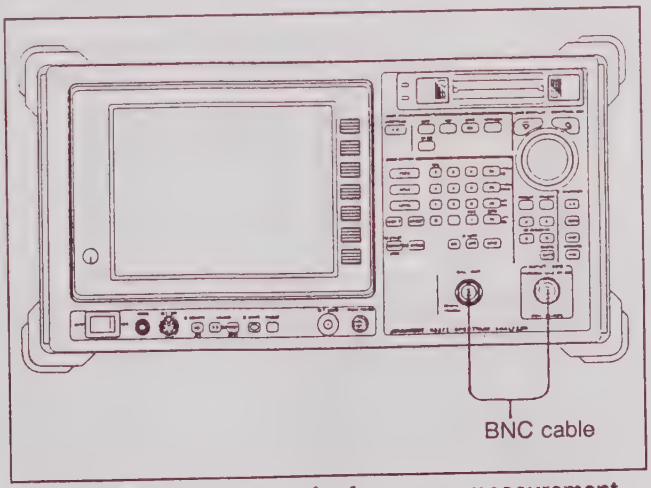

Figure 3-12 Connection for frequency measurement

4 Press [LEVEL] , [0] and [GHz] [+dBm sec] keys to set reference level to 0 dBm.

5 Press [FREQ] , [3] , [0] and [MHz] keys to set center frequency to 30 MHz.

Measurement by frequency counter

For continuous carrier signal, frequency can accurately be measured in COUNTER mode.
When frequency is measured with normal marker, the measured data corresponds to the position at which the marker is displayed and includes errors related to span accuracy, display resolution, etc.
In COUNTER mode frequency of the signal is measured directly by the frequency counter, so that measuring accuracy is increased to the accuracy of reference source. However, when the difference in level between marker point and displayed noise level is 25 dB or less, or when SPAN value is 1 GHz or more, measurement may not be accurate.

1 **Press** SHIFT **and** PRESET **keys to reset to initial setting.**

2 **Connect the N-BNC adapter to the INPUT connector on the front panel.**

3 **Connect CAL OUT and INPUT connectors on the front panel with the BNC cable (MC-61).**

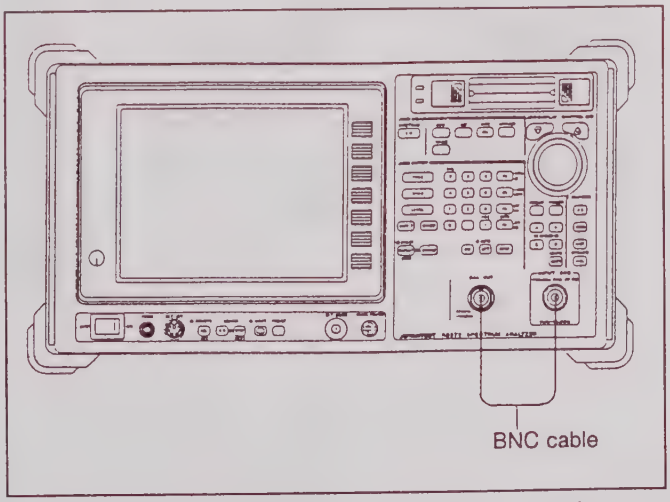

Figure 3-14 Measurement by frequency counter

6 **Press** [SPAN] , [5] **and** [MHz] **keys to set frequency span to 5 MHz.**

7 **Press** [SRCH] **key to display a marker at the maximum level on the screen.**

The frequency at marker position is displayed at upper right on the screen.

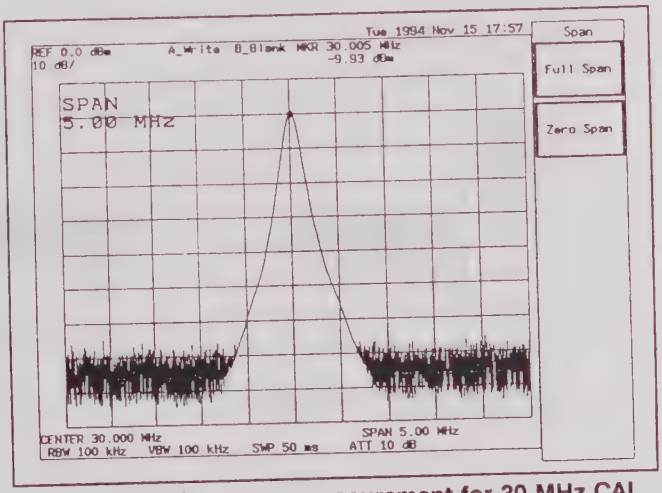

Figure 3-13 Frequency measurement for 30 MHz CAL signal

9 **Press** [Resolution 1Hz] **key to set counter resolution to 1 Hz.**

The frequency in MARKER mode at marker position is displayed at upper right on the screen.

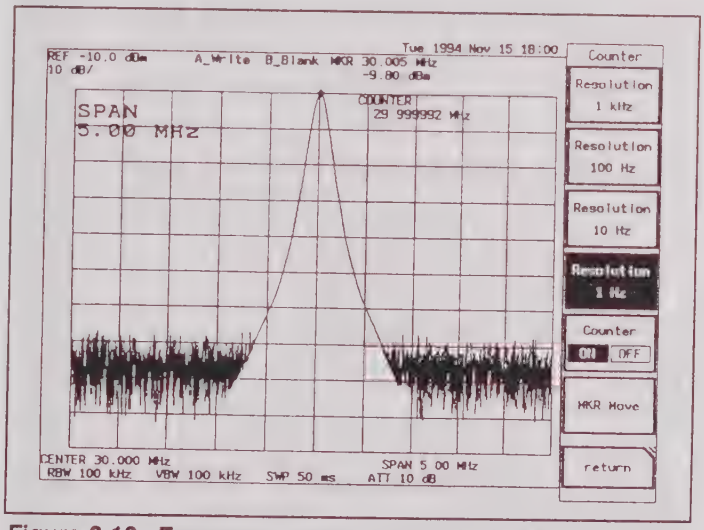

Figure 3-16 Frequency measurement in COUNTER mode

4 Press [LEVEL], [B·S / -], [1], [0] and [GHz / + dBm / sec] keys to set reference level to -10 dBm.

5 Press [FREQ], [3], [0] and [MHz] keys to set center frequency to 30 MHz.

6 Press [SPAN], [5] and [MHz] keys to set frequency span to 5 MHz.

7 Press [SRCH] key to display a marker at the maximum level on the screen.

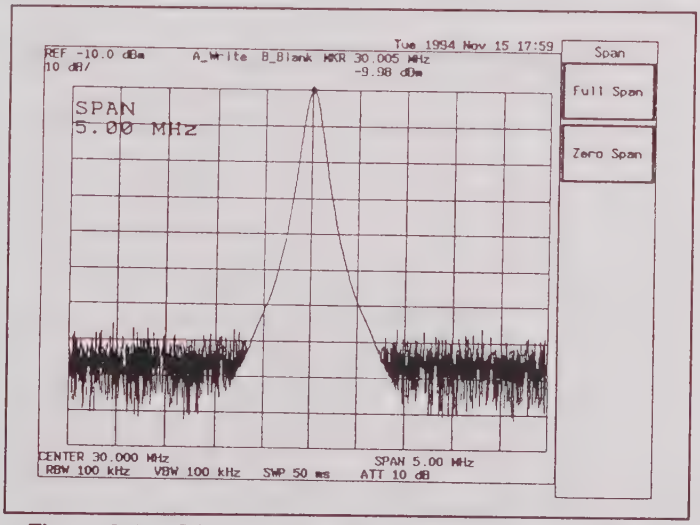

Figure 3-15 Display of maximum level at marker point

8 Press [CW], [Counter], and [Counter / ON / OFF] keys to set to COUNTER mode.

● **MKR⇒REF function**

This function makes the level at active marker position the reference level.
It is very useful to, for example, adjust the peak level of waveform to reference level.

<When peak level of waveform>

1 **Press** [⇒RL] **key.**

Then the peak level on the screen becomes the reference level.

<When not peak level of waveform>

1 **Press** [MARKER ON] **key, and turn the data knob to move the marker to the level point which is the reference level.**

2 **Press** [more 1/3], [Marker⇒] **and** [MKR⇒Ref] **keys.**

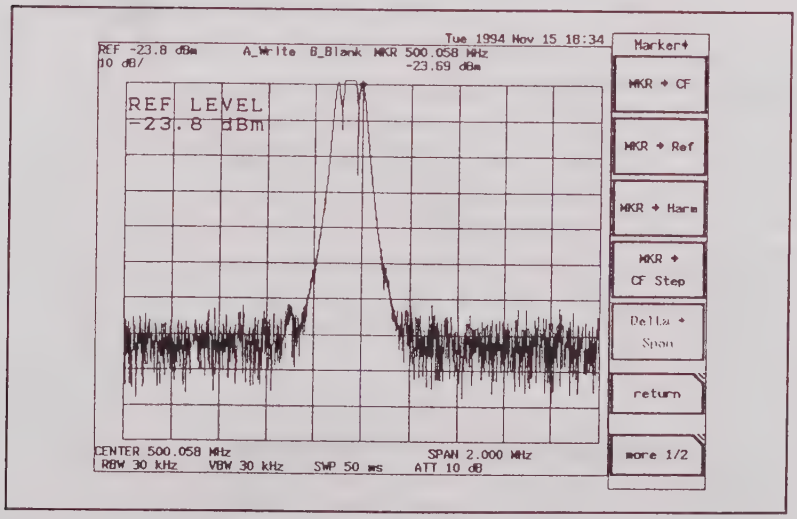

Figure 3-18 MKR⇒REF function

■ Convenient functions MKR⇨CF, MKR⇨REF

● MKR⇒CF function

This function makes the frequency at active marker position the center frequency.
It is very useful to, for example, adjust unknown frequency to center frequency.

<When peak level of waveform>

1 **Press** [⇒CF] **key.**

Then the frequency at peak level point on the screen becomes the center frequency.

<When not peak level of waveform>

1 **Press** [MARKER ON] **key, and turn the data knob to move the marker to the frequency point which is the center frequency.**

2 **Press** [more 1/3], [Marker⇒] **and** [MKR⇒CF] **keys.**

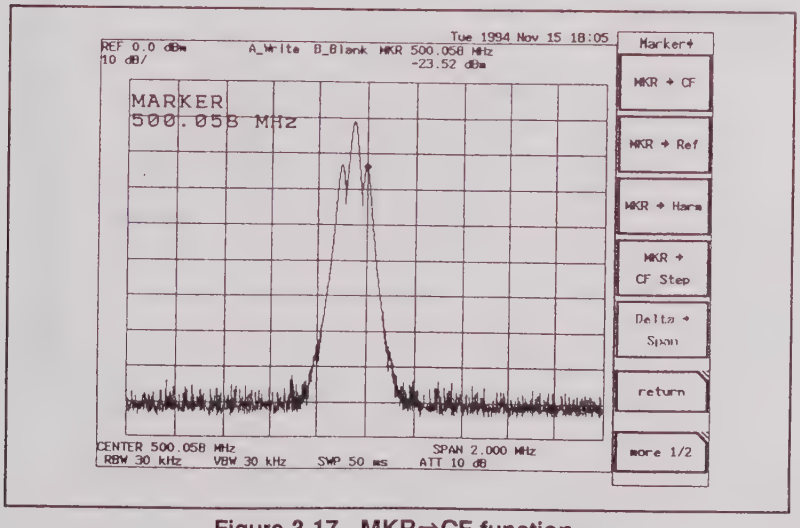

Figure 3-17 MKR⇒CF function

7. Dynamic Range and Sweep Rate

1 Press [SHIFT] and [PRESET] keys to reset to initial setting.

2 Connect the N-BNC adapter to the INPUT connector on the front panel.

3 Connect CAL OUT and INPUT connectors on the front panel with the BNC cable (MC-61).

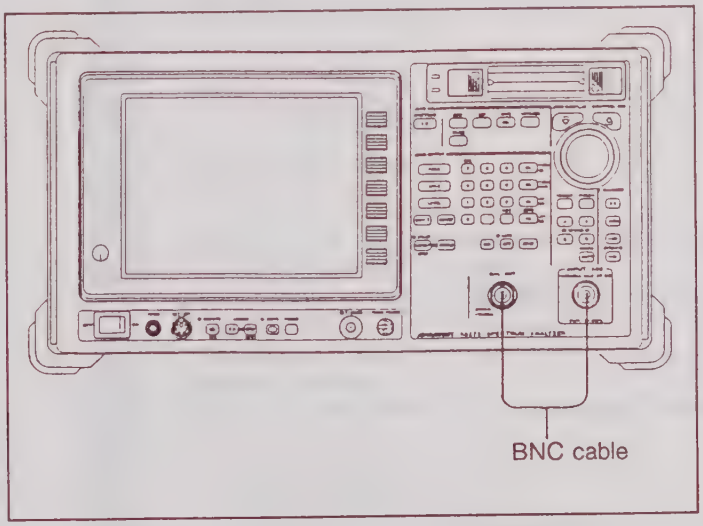

Figure 3-19 Dynamic range and sweep rate

4 Press [LEVEL] , [B·S -] , [1] , [0] and [GHz +dBm sec] keys to set reference level to -10 dBm.

5 Press [FREQ] , [3] , [0] and [MHz] keys to set center frequency to 30 MHz.

6 **Press** [SPAN] , [5] , [0] **and** [MHz] **keys to set frequency span to 50 MHz.**

7 **Press** [BW] , [RBW (AUTO / MNL)] , [1] , [0] , [0] **and** [MHz] **keys to set RBW to 100 kHz.**

Then display noise level decreases by 10 dB, expanding the display dynamic range.

8 **Press** [VBW (AUTO / MNL)] , [1] , [0] **and** [kHz] **keys to set VBW to 10 kHz.**

Setting VBW to approximately 1/10 of RBW averages noise level and obtains wider dynamic range.
Here, setting to "auto" automatically sets sweep rate . If sweep time is forcibly set to, for example, 50 ms, measurement cannot be made correctly due to the error of displayed waveform.
To obtain a high sweep rate, it is necessary to set as follows:

- Make RBW wider.
- Make VBW wider.
- Make frequency span narrower when RBW/VBW does not change.

Part 2

Applicable Instruments
R3465
R3272
R3263
R3463

How to Use This Manual

The following describes the structure of this manual.

- Part 1: Whole explanation for R3465
- Part 2: Performance test (Calibration)
  Applicable instruments are the R3465, R3272, R3263 and R3463.

1. PERFORMANCE TEST (CALIBRATION)

1.1 Introductory Description and UUT Performance Requirements

This procedure describes the performance test of the modulation spectrum analyzer R3465/3463 and the spectrum analyzer R3272/3263.

The unit being test will be referred to herein as the UUT (Unit-Under-Test).

UUT Environmental range	: TEMP. 20°C to 30°C RH 85% or less
UUT Warm-up/Stabilization period requirements	: 60 minutes

Table 1-1 UUT Performance Requirements (1 of 6)

Unit-Under-Test (UUT) Parameter/Function	Performance Specifications	Test Method
1. Frequency Readout Accuracy and Frequency Counter Marker Accuracy.	Frequency Readout Accuracy: < ± [Frequency reading × Frequency Reference Accuracy) + (Span × Span Accuracy) + (0.15 × RES.BW) + 10 Hz] Span Accuracy: Span > 5 MHz ± 4% Span ≦ 5 MHz ± 1% Marker Frequency Counter Accuracy: < ± [(Marker Frequency × Frequency Reference Accuracy) + (5 Hz × N) + 1LSD]	Signals are input from the SG where high-precision frequency standard is set as the reference frequency for measurement.
2. Frequency Reference Output Accuracy.	Frequency: $< 1 \times 10^{-7}$/year $< 2 \times 10^{-8}$/day	The frequency of CAL OUT signal locked to the internal 10 MHz reference is measured with the counter.
3. Noise Sidebands	f ≦ 3 GHz: 10 kHz offset < −100 dBc/Hz 100 kHz offset < −110 dBc/Hz f > 3 GHz: 10 kHz offset < (−98 + 20 log N) dBc/Hz 100 kHz offset < (−108 + 20 logN) dBc/Hz	Good noise sideband signals are input for measurement.
4. Frequency Span Accuracy	Linear Span: < ± 4% (Span > 5 MHz) < ± 1% (Span ≦ 5 MHz)	Signals at two frequencies according to each span are input to measure the difference between the frequencies.
5. Resolution Bandwidth Accuracy and Selectivity	Range Accuracy: 300 Hz to 3 MHz, 5MHz; 1, 3, 10 sequence ±20% 1 kHz to 1 MHz ±30% 300 Hz, 3 MHz, 5MHz Selectivity : <15:1 300 Hz to 5 MHz Resolution Bandwidth 5 MHz (50 dB/3 dB) Resolution Bandwidth 300 Hz to 3 MHz (60 dB/3 dB)	CAL OUT signals are input for measurement.

Table 1-1 UUT Performance Requirements (2 of 6)

Unit-Under-Test (UUT) Parameter/Function	Performance Specifications	Test Method
6. Resolution Bandwidth Switching Uncertainty	300 Hz to 3 MHz RBW: < ±0.3 dB (Reference to 300 kHz RBW) (3 × RBW ≥ Span)	CAL OUT signals are input for measurement.
7. Displayed Average Noise Level	(1 kHz res BW, 0 dB input attenuator, 1 Hz video filter) R3465: −70 dBm 10 kHz −80 dBm 100 kHz −{115−1.55f(GHz)} dBm 1 MHz to 3.0 GHz −115 dBm 1.7 GHz to 7.0 GHz −115 dBm 6.9 GHz to 8.0 GHz R3272: −70 dBm 10 kHz −80 dBm 100 kHz −{115−1.55f(GHz)} dBm 1 MHz to 3.1 GHz −110 dBm 3.0 GHz to 7.5 GHz −103 dBm 7.4 GHz to 15.4 GHz −96 dBm 15.2 GHz to 23.3 GHz −90 dBm 23 GHz to 26.5 GHz R3263/3463: −70 dBm 10 kHz −80 dBm 100 kHz −{115−1.55f(GHz)} dBm 1 MHz to 3.0 GHz	No signal is input and average noise level at each frequency is measured.

Table 1-1 UUT Performance Requirements (3 of 6)

<table>
<tr><th>Unit-Under-Test (UUT) Parameter/Function</th><th>Performance Specifications</th><th>Test Method</th></tr>
<tr><td>8. Gain Compression (1 dB)</td><td>−5 dBm mixer input level >10 MHz</td><td>Two signals are input simultaneously to measure the level at which one of the signals is lowered by 1 dB.</td></tr>
<tr><td>9. Residual Response</td><td>(no signal at input, 0 dB input Attenuator, 50 Ω termination)
R3465:
< −100 dBm | 1 MHz to 3.0 GHz
< −90 dBm | 300 kHz to 8.0 GHz

R3272:
< −100 dBm | 1 MHz to 3.0 GHz
< −90 dBm | 300 kHz to 26.5 GHz

R3263/3463:
< −100 dBm | 1 MHz to 3.0 GHz
< −90 dBm | 300 kHz to 3.0 GHz</td><td>No signal is input and the test is terminated at 50 Ω.</td></tr>
<tr><td>10. Second Harmonic Distortion</td><td>R3465:
< −70 dBc | 10 MHz to 3.0 GHz | −30 dBm
< −90 dBc | >1.7 GHz | −10 dBm

R3272:
< −70 dBc | 10 MHz to 3.0 GHz | −30 dBm
< −100 dBc | >3.0 GHz | −10 dBm

R3263/3463:
< −70 dBc | 10 MHz to 3.0 GHz | −30 dBm</td><td>The lowpass filter is connected to the SG output for measurement.</td></tr>
</table>

Table 1-1 UUT Performance Requirements (4 of 6)

<table>
<tr><th>Unit-Under-Test (UUT) Parameter/Function</th><th>Performance Specifications</th><th>Test Method</th></tr>
<tr><td>11. Third Order Intermodulation Distortion</td><td>Separation: 12.5 kHz
Resolution bandwidth: 300 Hz
Video bandwidth: 3 Hz or less

R3465:
<table><tr><th></th><th>frequency range</th><th>mixer level</th></tr><tr><td>< −75 dBc</td><td>10 MHz to 3.0 GHz</td><td>−30 dBm</td></tr><tr><td>< −75 dBc</td><td>>1.7 GHz</td><td>−30 dBm</td></tr></table>R3272:
<table><tr><th></th><th>frequency range</th><th>mixer level</th></tr><tr><td>< −75 dBc</td><td>10 MHz to 3.0 GHz</td><td>−30 dBm</td></tr><tr><td>< −75 dBc</td><td>>3.0 GHz</td><td>−30 dBm</td></tr></table>R3263/3463:
<table><tr><th></th><th>frequency range</th><th>mixer level</th></tr><tr><td>< −75 dBc</td><td>10 MHz to 3.0 GHz</td><td>−30 dBm</td></tr></table></td><td>Two neighboring signals are input simultaneously for measurement.</td></tr>
<tr><td>12. Image, Multiple, Out of Band Response</td><td>R3465:
< −70 dBc (10 MHz to 8 GHz)

R3272:
< −70 dBc (10 MHz to 18 GHz)
< −60 dBc (10 MHz to 23 GHz)
< −50 dBc (10 MHz to 26.5 GHz)

R3263/3463:
< −70 dBc (10 MHz to 3 GHz)</td><td>Signals allowing image, multiple and out of band response as against the center frequency are input for measurement.</td></tr>
</table>

Table 1-1 UUT Performance Requirements (5 of 6)

Unit-Under-Test (UUT) Parameter/Function	Performance Specifications	Test Method
13. Frequency Response	10 dB input attenuator R3465: ±1.5 dB 9 kHz to 3.0 GHz ±1.0 dB 50 MHz to 3.0 GHz ±1.5 dB 1.7 GHz to 7.0 GHz ±1.5 dB 6.9 GHz to 8 GHz Frequency Response Referenced to CAL Signal: ±3 dB 9 kHz to 8 GHz R3272: ±1.5 dB 9 kHz to 3.1 GHz ±1.0 dB 50 MHz to 3.1 GHz ±1.5 dB 3.0 GHz to 7.5 GHz ±3.5 dB 7.4 GHz to 15.4 GHz ±4.0 dB 15.4 GHz to 23.3 GHz ±4.0 dB 23 GHz to 26.5 GHz Frequency Response Referenced to CAL Signal: ±5 dB 9 kHz to 26.5 GHz R3263/3463: ±1.5 dB 9 kHz to 3.0 GHz ±1.0 dB 50 MHz to 3.0 GHz Frequency Response Referenced to CAL Signal: ±2 dB 9 kHz to 3.0 GHz	The signal level of SG at a certain level on the screen is measured at each frequency with the power meter.
14. IF Gain Uncertainty	(after automatic calibration) ±0.5 dB 0 dBm to −50 dBm	The REF level is raised while lowering the signal level with the SG to measure the error.
15. Scale Fidelity	(after automatic calibration) Log: ±0.2 dB/1 dB, ±1 dB/10 dB, ±1.5 dB/80 dB Linear: ±15% of reference level (within 8 Div)	Input signal is lowered with the SG for measurement.

Table 1-1 UUT Performance Requirements (6 of 6)

Unit-Under-Test (UUT) Parameter/Function	Performance Specifications	Test Method
16. Input Attenuator Accuracy	(20 dB to 70 dB settings referenced to 10 dB) R3465: ±1.1 dB/10 dB step, 2.0 dB max, 9 kHz to 8 GHz R3272: ±1.1 dB/10 dB step, 2.0 dB max, 9 kHz to 12.4 GHz ±1.3 dB/10 dB step, 2.5 dB max, 12.4 GHz to 18 GHz ±1.8 dB/10 dB step, 3.5 dB max 18 GHz to 26.5 GHz R3263/3463: ±1.1 dB/10 dB step, 2.0 dB max, 9 kHz to 3.0 GHz	Signal at a frequency is input and measured with the internal attenuator.
17. Calibration Amplitude Accuracy	Amplitude: −10 dBm ± 0.3 dB	CAL OUT signals are measured with the power meter.

1.2 Measurement Standards and Support Test Equipment Performance Requirement

Minimum-Use-Specifications (MUS) are the calculated minimum performance specifications criteria needed for the Measurement Standards (MS) and support M&TE to be used for the comparison measurements required in the Test Procedure (TP) process.

The MUS is developed through uncertainty analysis and is calculated through assignment of a defines and documented uncertainty/accuracy ratio or margin between the specified tolerances of the UUT and the capability (uncertainty specification) required of the measurement standards system. MUS is required to assist a measurement specialist in the evaluation of existing or selection of alternate measurement standards equipment.

The uncertainty/accuracy ratio applied in this TP is 10:1 and any exception to that is indicated in Section 1.1.

CAUTION

The instructions in this TP relate specifically to the equipment and conditions listed in Section 1.2. If other equipment is substituted, the information and instructions must be interpreted and revised accordingly.

MS and SM&TE Environmental Range	:	Temperature	:	18°C to 28°C
	:	Relative Humidity	:	30% to 70%
MS and SM&TE Warm-up/Stabilization Period Requirements			:	60 minutes

Table 1-2 Measurement Standards (MS) Performance Requirements

Equipment Generic Name (Quality)	Minimum-Use-Specifications	Note
Frequency Standard	Output Frequency : 10 MHz Stability : 5×10^{-10}/day Output Impedance : about 50 Ω Output Voltage : 1 Vpp or more	
Synthesized Sweeper	Frequency Range : 10 MHz to 18 GHz Frequency Accuracy (CW): 3×10^{-8}/day Power Level Range : −20 dBm to +15 dBm	SG1
Frequency Counter	Frequency Range : 10 Hz to 120 MHz Gate Time : 10s Number of Digits Displayed : 8 digits Input Voltage Range : 25 mVrms to 500 mVrms	
Synthesized Signal Generator	Frequency Range : 10 MHz to 4 GHz Residual SSB Phase Noise: 1 kHz offset < −115 dBc/Hz 10 kHz offset < −125 dBc/Hz 100 kHz offset < −130 dBc/Hz Power Level Range: −20 dBm to +10 dBm	SG2
Power Meter	Accuracy : ±0.02 dB (dB Relative Mode)	
Power Sensor	Frequency Range : 50 MHz to 26.5 GHz Power Range : 1 μW to 100 mW Maximum SWR : 1.25 (26.5 GHz)	Sensor 1
	Frequency Range : 10 MHz to 18 GHz Power Range : 1 μW to 10 mW	Sensor 2
Synthesized Sweeper	Frequency Range : 10MHz to 26.5 GHz Power Level Range: −20 dBm to +10 dBm	SG3
Synthesized Level Generator	Frequency Range :30 MHz Power Level Range :-60dBm to +10dBm Absolute Level Accuracy : ±0.2 dB	SG4

Table 1-3 Support Measuring & Test Equipment (M&TE) Performance Requirements

Equipment Generic Name (Quality)	Minimum-Use-Specifications	Note
Adapter	Type N(m) to BNC(f)	
	Type N(m) to SMA(f)	
	SMA(m) to SMA(m)	
	Type N(f) to BNC(m)	
50 Ω Termination	SMA	
20dB Fixed, 3dB Fixed Attenuator	Frequency Range : DC to 26.5 GHz Connector : SMA(m), SMA(f)	
Power Splitter	Frequency Range : 10 MHz to 26.5 GHz Insertion Loss : 6 dB (nominal)	
Low-pass Filter	Cutoff Frequency : 2.2 GHz Rejection at 3 GHz : >40 dB Rejection at 3.8 GHz: >80 dB	
Power Divider	Frequency Range : 2 MHz to 2 GHz Isolation : >20 dB	Divider 1
	Frequency Range : 2 GHz to 4 GHz Isolation : >20 dB	Divider 2
Cable	Frequency Range : DC to 26.5 GHz Maximum SWR : <1.45 GHz at 26.5 GHz Length : about 70 cm Connector : SMA(m) both ends	
	Length : 150 cm Connector : BNC(m) both ends	
	Length : 10 cm Connector : BNC(m) both ends	

.3 Preliminary Operations

WARNING

Always makes sure spectrum analyzer's power supply cord is plugged into a 3-hole grounded outlet or 2-hole outlet with grounded adapter. You can be fatally shocked if you fail to follow this rule.

Do not touch live circuits when calibrating instrument.

(1) Review this entire procedure before starting calibration procedure.

(2) Always confirm that the POWER switch is OFF before connecting the power cable to the AC line.

1.4 Performance Test Process

1.4.1 Accuracy of Frequency Readout and Frequency Counter Marker

- SPECIFICATION

  Frequency Readout Accuracy < ± [(Frequency reading × Frequency Reference Accuracy) + (Span × Span Accuracy) + (0.15 × RES.BW) + 10 Hz]

  Span Accuracy: Span > 5MHz ±4%
  Span ≤ 5MHz ±1%

  Marker Frequency Counter Accuracy < ± [(Marker Frequency × Frequency Reference Accuracy) + (5 Hz × N) + 1 LSD]

- RELATED ADJUSTMENT
  YTO Adjustment
  10 MHz Frequency Reference Adjustment

- DESCRIPTION
  The accuracy of the R3465/3272/3263/3463 frequency readout and frequency counter marker is tested with an input signal of known frequency.

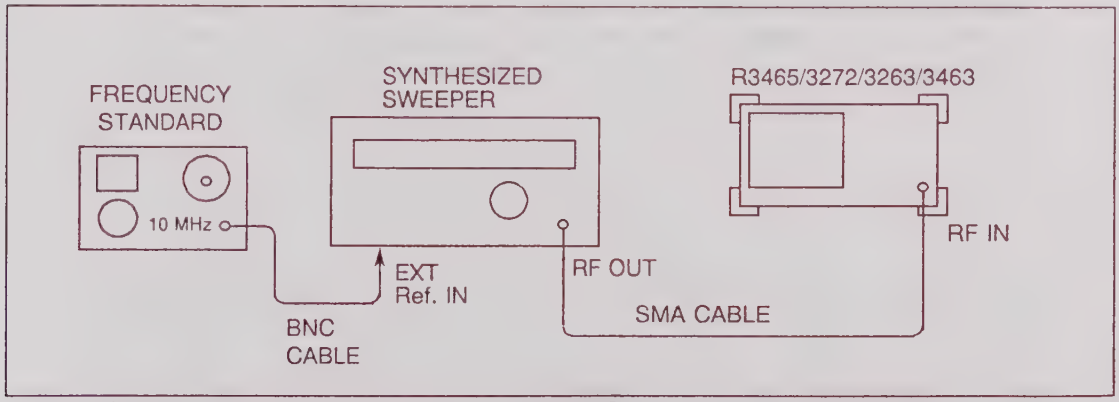

Figure 1-1 Frequency Readout and Frequency Counter Marker Accuracy Test Setup

- EQUIPMENT
  Frequency Standard
  Synthesized Sweeper (SG3)

  Cables:
  SMA, 70 cm
  BNC, 150 cm

- PROCEDURE

(1) Connect the equipment as shown in Figure 1-1

[Frequency Readout Accuracy]

(2) Press the INSTRUMENT [PRESET] key on the SG3. Set the SG3 controls as follows:

CW	1.5 GHz
Power Level	−10 dBm
Frequency Reference	EXT (Rear Panel)

(3) On the R3465/3272/3263/3463, press the [SHIFT] and [PRESET] keys and set the controls as follows:

Center Frequency	1.5 GHz
Span	5 MHz

(4) For the R3465, press [FREQ], [more 1/2] and [Preselector] [1.7G] [3.0G] keys to set the preselector to 3.0 GHz.

(5) On the R3465/3272/3263/3463, press the [SRCH] key. Record the MKR frequency on Table 1-4 as the Actual Marker Reading. The reading should be within the limits shown.

(6) Repeat step (5) for all the frequency and span combinations listed in Table 1-4. Peak the R3465/3272 preselector for and set the Analyzer and the SG3 [CW] key to frequencies of 5 GHz and above.

[Frequency Counter Marker Accuracy]

(7) Set the [SPAN] key of the R3465/3272/3263/3463 to 5 MHz.

Press the [CW], [Counter], [Preselector] and [Counter] [ON] [OFF] keys to set the counter to ON.

(8) Key in the SG3 [CW] frequencies and the R3465/3272/3263/3463 center as indicated in Table 1-5. For each pair of settings, press the [SRCH] key and record the MKR frequency at each point in Table 1-5.
The marker readings should be within the limits shown.

Table 1-4 Frequency Readout Accuracy

SG3 Frequency (GHz)	R3465/3272/3263/3463		△ Marker Reading		
	Span	Center Frequency	Min. (GHz)	Actual (GHz)	Max. (GHz)
1.5	1 MHz	1.5 GHz	1.499988		1.500012
1.5	10 MHz	1.5 GHz	1.49958		1.50042
1.5	50 MHz	1.5 GHz	1.49784		1.50216
1.5	100 MHz	1.5 GHz	1.4958		1.5042
1.5	2 GHz	1.5 GHz	1.419		1.581
<R3465/3272 ONLY>					
5	1 MHz	5 GHz	4.999987		5.000013
5	10 MHz	5 GHz	4.99958		5.00042
5	50 MHz	5 GHz	4.99784		5.00216
5	100 MHz	5 GHz	4.9958		5.0042
5	2 GHz	5 GHz	4.919		5.081
<R3272 ONLY>					
11	1 MHz	11 GHz	10.999987		11.000013
11	10 MHz	11 GHz	10.99958		11.00042
11	50 MHz	11 GHz	10.99784		11.00216
11	100 MHz	11 GHz	10.9958		11.0042
11	2 GHz	11 GHz	10.919		11.081
18	1 MHz	18 GHz	17.999986		18.000014
18	10 MHz	18 GHz	17.99958		18.00042
18	50 MHz	18 GHz	17.99784		18.00216
18	100 MHz	18 GHz	17.9958		18.0042
18	2 GHz	18 GHz	17.919		18.081

Table 1-5 Marker Frequency Counter Accuracy

SG3 Frequency (GHz)	R3465/3272/3263/3463 Center Frequency (GHz)	Marker Frequency		
		Min.(GHz)	Actual(GHz)	Max.(GHz)
1.5	1.5	1.499999844		1.500000156
<R3465/3272 ONLY>				
5	5	4.999999494		5.000000506
<R3272 ONLY>				
11	11	10.999998889		11.000001111
18	18	17.999998184		18.000001816

1.4.2 Frequency Reference Output Accuracy

- SPECIFICATION

  Frequency: $< 1 \times 10^{-7}$/year, $< 2 \times 10^{-8}$/day

- RELATED ADJUSTMENT

  Frequency Reference Adjustment

- DESCRIPTION

  The 10 MHz reference signal is measured for frequency accuracy by measuring the frequency of the 30 MHz CAL OUTPUT signal. The CAL OUTPUT signal is referenced to the 10 MHz reference.

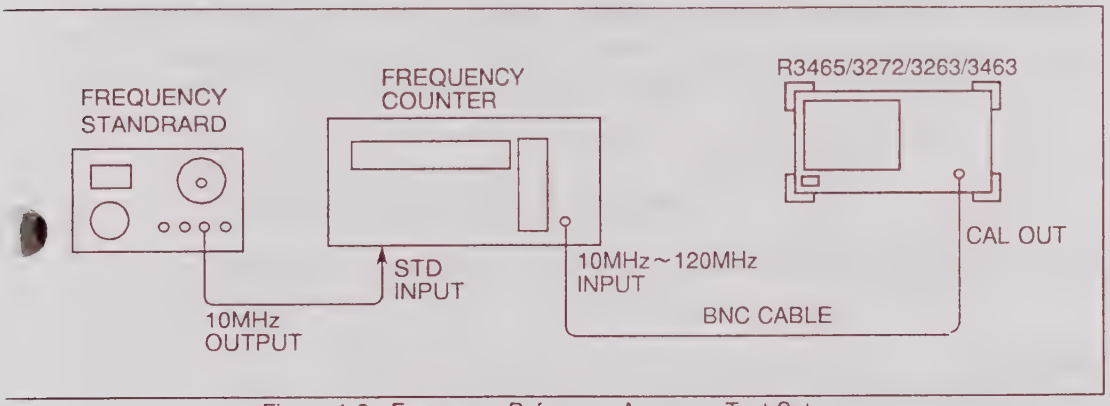

Figure 1-2 Frequency Reference Accuracy Test Setup

- EQUIPMENT

  Frequency Counter
  Frequency Standard

  Cables:
  BNC, 150 cm (Two required)

- PROCEDURE

(1) Connect the equipment as shown in Figure 1-2.

(2) Set the Frequency counter controls as follows:

FREQUENCY STD SWITCH (Rear Panel) ..... EXT
GATE TIME ..... 10 sec

(3) Press the SHIFT [ ] and PRESET [ ] keys on the R3465/3272/3263/3463.

CAUTION

Before starting this measurement, perform warm-up operation of the R3465/3272/3263/3463 for more than 30 minutes. If the frequency reference of the R3465/3272/3263/3463 is set to EXT, set it to INT or perform 15-minute warm-up operation after instrument preset.

(4) Wait for the frequency counter to settle down.

(5) Read the frequency counter display. The frequency should be within the following limits:

(2)*9.9999970 ≤ _____ ≤ (2)*0.0000030
*: The counter can display only eight digits.

1.4.3 Noise Sidebands

- SPECIFICATION

  Noise Sidebands:

Offset	f ≤3.0 GHz	f>3.0 GHz
10 kHz	< −100 dBc/Hz	< (−98 + 20 logN) dBc/Hz
100 kHz	< −110 dBc/Hz	< (−108 + 20 logN) dBc/Hz

- RELATED ADJUSTMENT

  There is no related adjustment procedure for this performance test.

- DESCRIPTION

  The noise sidebands of a 1.5 GHz and 3.5 GHz, − 10 dBm signal are measured at an offset of 10 kHz and 100 kHz from the carrier.

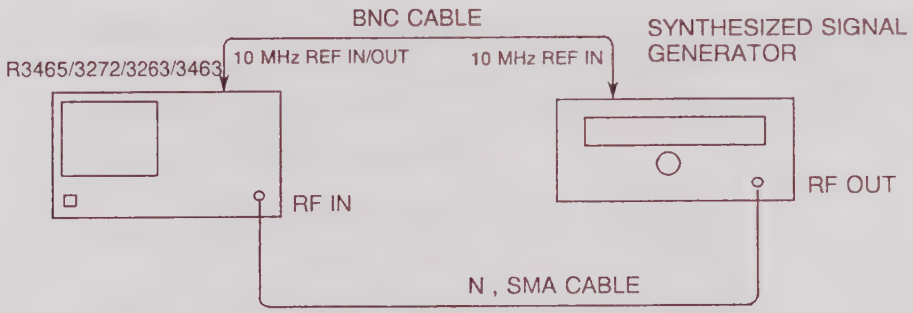

Figure 1-3 Noise Sidebands Test Setup

- EQUIPMENT: Synthesized Signal Generator (SG2)

  Cables: BNC, 150 cm
  SMA, 70cm

- PROCEDURE

(1) Connect the equipment as shown in Figure 1-3.

(2) Set the Signal Generator (SG2) controls as follows:

Frequency ..... 1.5 GHz & 3.5 GHz
CW Output ..... −5 dBm

(3) Press the [SHIFT] and [PRESET] keys on the R3465/3272/3263/3463.
Press [FREQ], [1], [.], [5] and [GHz] keys.
Since the measurement is made for each of 10 kHz and 100 kHz offset frequency, set the span frequency to 2.5 times each offset frequency, or 25 kHz and 250 kHz. Keep other settings unchanged.

(4) Operate keys on the R3465/3272/3263/3463 as follows to measure noise sidebands of each offset frequency. The measurement procedure for 100 kHz offset frequency is explained here, and the procedure is applicable for 10 kHz offset frequency.
Set the span corresponding to offset.
Press the [→RL] key.
Press the [CW], [more 1/2], [NOISE/ XHz] and [dBc/Hz] keys.

Press [1], [0], [0] and [kHz] keys to set each offset frequency.
Press the reference level by 20 dB and perform averaging for about 20 samples. After averaging, read the marker level and write it down in Table 1-6.
For the R3465/3272, measure noise sidebands with the center frequency at 3.5 GHz, and Table 1-6 is completed.

Table 1-6 Noise Sidebands

Offset (kHz)	CF 1.5 GHz		CF 3.5 GHz	
	Actual (dBc/Hz)	Max. (dBc/Hz)	Actual (dBc/Hz)	Max. (dBc/Hz)
10		−100		−98
100		−110		−108

1.4.4 Frequency Span Accuracy

- SPECIFICATION
  - < ± 4% of actual frequency separation (SPAN > 5 MHz)
  - < ± 1% of actual frequency separation (SPAN ≤ 5 MHz)

- RELATED ADJUSTMENT
  - Span adjustment.

- DESCRIPTION

Set the signal frequency twice with the synthesized sweeper and measure the difference between signal frequencies with the analyzer.
Check the span accuracy using the signal frequency difference measured with the △ MARKER function.

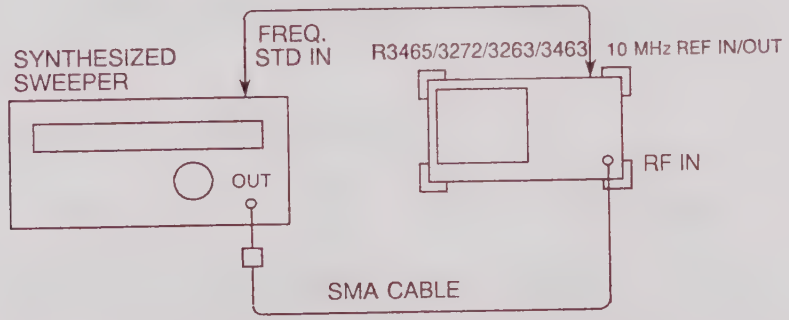

Figure 1-4 Frequency Span Accuracy Test Setup

- EQUIPMENT
  - Synthesized Sweeper (SG3)

  Cables:
  - SMA, 70 cm
  - BNC, 150 cm

- PROCEDURE

(1) Connect the equipment as shown in Figure 1-4.

(2) Set the SG3 controls as follows:

CW	1.498 GHz
Power Level	−5 dBm
Frequency STD Switch (Rear Panel)	EXT

(3) On the R3465/3272/3263/3463, press the SHIFT [ ], PRESET [ ] key and set the R3465/3272/3263/3463 controls as follows:

Center Frequency	1.5 GHz
Span	5 MHz

(4) On the R3465/3272/3263/3463, press the [SINGLE], [SRCH], MARKER [ON] and [Delta MKR] keys.

(5) Set the SG3 controls as follows:

CW	1.502 GHz

(6) On the R3465/3272/3263/3463, press the [SINGLE] and [SRCH] keys.
Record the △ MARKER frequency reading as the Actual △ MARKER Reading in Table 1-7.
The reading should be within the limits shown.

(7) On the R3465/3272/3263/3463, press the MARKER [ON] and [Normal MKR] keys.

(8) Set the frequency of the SG3, the center frequency and span of the R3465/3272/3263/3463 as shown in Table 1-7, and repeat steps (5) through (8).

Table 1-7 Frequency Span Accuracy

SG3 1st Frequency	SG3 2nd Frequency	R3465/3272/3263/3463		Δ Marker Reading		
		Center Frequency	Span Setting	Min.	Actual	Max.
1.498 GHz	1.502 GHz	1.5 GHz	5 MHz	3.96 MHz		4.04 MHz
1.498 GHz	1.502 GHz	1.5 GHz	5.01 MHz	3.847 MHz		4.169 MHz
1.484 GHz	1.516 GHz	1.5 GHz	40 MHz	30.72 MHz		33.28 MHz
1.34 GHz	1.66 GHz	1.5 GHz	400 MHz	307.2 MHz		332.8 MHz
<R3465/3272 ONLY>						
2.4 GHz	5.6 GHz	4.0 GHz	4 GHz	3.072 GHz		3.328 GHz
0.8 GHz	7.2 GHz	4.0 GHz	8 GHz	6.144 GHz		6.656 GHz
<R3272 ONLY>						
6 GHz	14 GHz	10 GHz	10 GHz	7.68 GHz		8.32 GHz
2 GHz	18 GHz	10 GHz	19 GHz	15.36 GHz		16.64 GHz

1.4.5 Resolution Bandwidth Accuracy and Selectivity

- SPECIFICATION

  Range: 300 Hz to 3 MHz, 5 MHz; 1, 3, 10 Sequence

  Accuracy: ±20% (Resolution Bandwidth 1 kHz to 1 MHz)
  ±30% (Resolution Bandwidth 300 Hz, 3 MHz, 5 MHz)

  Selectivity: <15:1 (300 Hz to 5 MHz)
  (Resolution Bandwidth 5 MHz 50dB BW/3 dB BW)
  (Resolution Bandwidth 300 Hz to 3 MHz
  60dB BW/3 dB BW)

- RELATED ADJUSTMENT

- DESCRIPTION
  This test measures the resolution bandwidth accuracy and selectivity. The 60 dB bandwidth is then determined and the results used to calculate the selectivity for each bandwidth.

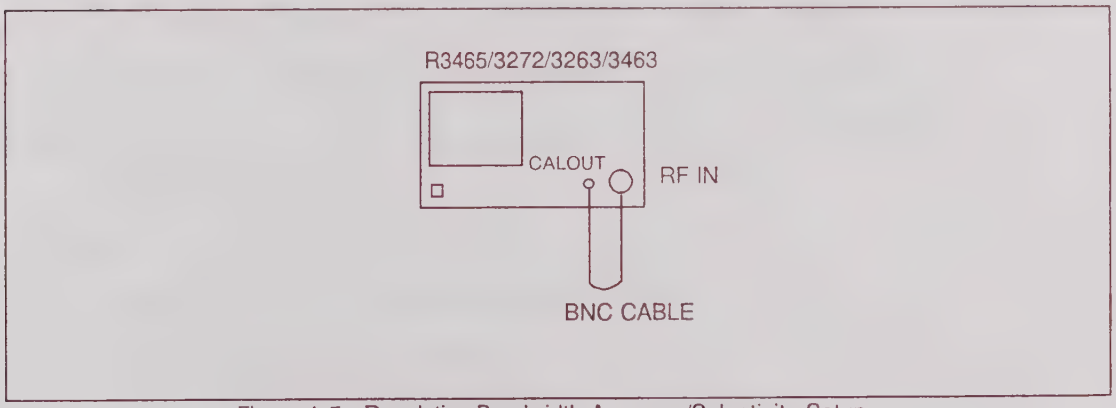

Figure 1-5 Resolution Bandwidth Accuracy/Selectivity Setup

- EQUIPMENT

  Adapters :
  Typed N(m) to BNC (f)

  Cable:
  BNC 10 cm

- PROCEDURE

[Resolution Bandwidth Accuracy]

(1) Connect the R3465/3272/3263/3463 CALOUT to the RF IN as shown in Figure 1-5.

(2) Press SHIFT , PRESET keys and set the controls as follows:

Press FREQ , 3 , 0 and MHz keys.

Press SPAN , 1 , 5 and MHz keys.

Press LEVEL , 5 , -dBm , dB/div and 1dB/DIV keys.

Press BW , RBW AUTO MNL , 5 and MHz keys.

Press FORMAT , Trace Detector and Posi keys.

(3) Press SINGLE key, and wait for a new sweep to finish.

(4) Press SRCH , MARKER ON , more 1/3 , X dB DOWN , 3 and dB keys.

(5) Record the marker frequency in Tables 1-8 and 1-9 as actual 3 dB bandwidth.

(6) Change the RBW and span frequency as shown in Table 1-8, and repeat steps (3), (4) and (5) for remaining RBWs.

[Resolution Bandwidth Selectivity]

(7) Press SHIFT , PRESET and set the controls as follows:

Press FREQ , 3 , 0 and MHz keys.

Press SPAN , 2 , 5 and MHz keys.

Press BW , RBW AUTO MNL , 5 and MHz keys.

Press VBW AUTO MNL , 1 , 0 and kHz keys.

Press FORMAT , Trace Detector and Posi keys.

(8) Press [SINGLE] key.

(9) Press [SRCH], [MARKER ON], [more 1/3], [x dB DOWN], [5], [0] and [dB] keys.

(10) Record the marker frequency in Table 1-9 as actual 60 dB bandwidth.

(11) Divide the 60 dB bandwidth by the 3 dB bandwidth and record as the Actual Resolution Bandwidth Selectivity in Table 1-9.

(12) Change the RBW and span frequency as shown in Table 1-9, and repeat steps (8) through (11) for remaining RBWs.

Set VBW to AUTO if RBW is 10kHz or below.

Table 1-8 Resolution Bandwidth Accuracy

Resolution Bandwith Setting	Frequency Span Setting	3dB Bandwidth		
		Min.	Actual	Max.
5 MHz	10 MHz	3.50 MHz		6.5 MHz
3 MHz	5 MHz	2.1 MHz		3.9 MHz
1 MHz	2 MHz	800 kHz		1.2 MHz
300 kHz	500 kHz	240 kHz		360 kHz
100 kHz	200 kHz	80 kHz		120 kHz
30 kHz	50 kHz	24 kHz		36 kHz
10 kHz	20 kHz	8.0 kHz		12.0 kHz
3 kHz	5 kHz	2.4 kHz		3.6 kHz
1 kHz	2 kHz	800 Hz		1200 Hz
300 Hz	2 kHz	210 Hz		390 Hz

Table 1-9 Resolution Bandwidth Selectivity

Resolution Bandwidth Setting	Frequency Span Setting	60 dB Bandwidth	3 dB Bandwidth	Selectivity	
				Actual	Max.
*1) 5 MHz	25 MHz				
3 MHz	25 MHz				15
1 MHz	20 MHz				15
300 kHz	5 MHz				15
100 kHz	1 MHz				15
30 kHz	500 kHz				15
10 kHz	200 kHz				15
3 kHz	50 kHz				15
1 kHz	20 kHz				15
300 Hz	5 kHz				15

*1: RBW 5MHz Selectivity = 50 dB/3 dB

1.4.6 Resolution Bandwidth Switching Uncertainty

- SPECIFICATION

  300 Hz to 3 MHz RES BW: < ± 0.3 dB (referred to 300 kHz RBW)

- RELATED ADJUSTMENT
  There is no related adjustment procedure for this performance test.

- DESCRIPTION
  This test utilizes the CALOUT signal for measuring the switching uncertainty between resolution bandwidths. At each resolution bandwidth setting, the displayed amplitude variation of the signal in measured. All measurements are referenced to the 300 kHz bandwidth.

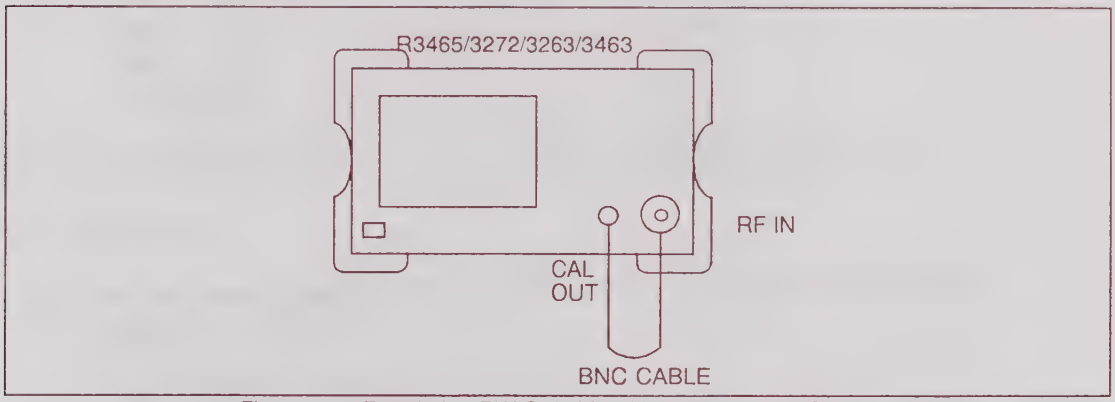

Figure 1-6 Resolution BW Switching Uncertainty Test Setup

- EQUIPMENT

  Adapters :
  Typed N(m) to BNC (f)

  Cable:
  BNC 10 cm

- PROCEDURE

(1) Connect the R3465/3272/3263/3463 CALOUT to the RF IN as shown in Figure 1-6.

(2) Press the SHIFT, PRESET, CAL 7, EACH ITEM and RBW SWITCH keys.

Wait for the "Calibration in progress" message to disappear.
Set the instrument controls as follows:

Center Frequency	30 MHz
Span	500 kHz
Ref Level	−5 dBm
RBW	300 kHz
Sweep Mode	SINGLE
dB/Div	1 dB/Div
Trace Detector	Posi

(3) Press the SINGLE, SRCH, ON, Delta MKR and FIXED MKR ON OFF keys to set the MKR to ON.

(4) Set the frequency span and RBW to the values listed in the second entry of Table 1-10 (Span 5 MHz, RBW 3 MHz).

(5) Press the SINGLE, SRCH keys.

Record the △MARKER amplitude in the Actual △ MARKER Reading column of Table 1-10. The MARKER reading should be within the limit shown.

(6) Repeat steps (4) and (5) for each set of frequency span and RBW settings in Table 1-10.

Table 1-10 Resolution BW Switching Uncertainty

R3465/3272/3263/3463		Δ Marker Reading		
Span	RBW	Min. (dB)	Actual	Max. (dB)
500 kHz	300 kHz	0	0 (Ref.)	0
5 MHz	3 MHz	–0.3		+0.3
2 MHz	1 MHz	–0.3		+0.3
200 kHz	100 kHz	–0.3		+0.3
50 kHz	30 kHz	–0.3		+0.3
20 kHz	10 kHz	–0.3		+0.3
5 kHz	3 kHz	–0.3		+0.3
2 kHz	1 kHz	–0.3		+0.3
2 kHz	300 Hz	–0.3		+0.3

1.4.7 Displayed Average Noise Level

- SPECIFICATIONS

Displayed Average Noise level: Resolution bandwidth 1 kHz, input attenuator 0 dB, video bandwidth 1 Hz.

R3465

Frequency range	Average Noise Level
10 kHz	−70 dBm
100 kHz	−80 dBm
1 MHz to 3.0 GHz	−{115−1.55×f(GHz)} dBm
1.7 GHz to 8.0 GHz	−115 dBm

R3272

Frequency range	Average Noise Level
10 kHz	−70 dBm
100 kHz	−80 dBm
1 MHz to 3.1 GHz	−{115−1.55×f(GHz)} dBm
3.0 GHz to 7.5 GHz	−110 dBm
7.5 GHz to 15.4 GHz	−103 dBm
15.2 GHz to 23.3 GHz	−96 dBm
23 GHz to 26.5 GHz	−90 dBm

R3263/3463

Frequency range	Average Noise Level
10 kHz	−70 dBm
100 kHz	−80 dBm
1 MHz to 3.0 GHz	−{115−1.55×f(GHz)} dBm

- RELATED ADJUSTMENT

Frequency response adjustment

- DESCRIPTION

  This test measures the displayed average noise level in all frequency tests. The analyzer's input is terminated at 50 Ω. In Band 1, in the frequency range from 9 kHz to 3.0 GHz, the test first measures the average noise at 10 kHz and 100 kHz, then at any frequency point in zero span. For the rest of Band 1, and for all remaining bands, the test tunes the analyzer frequency across the band, uses the marker to locate the frequency with the highest response, and then reads the average noise in zero span.

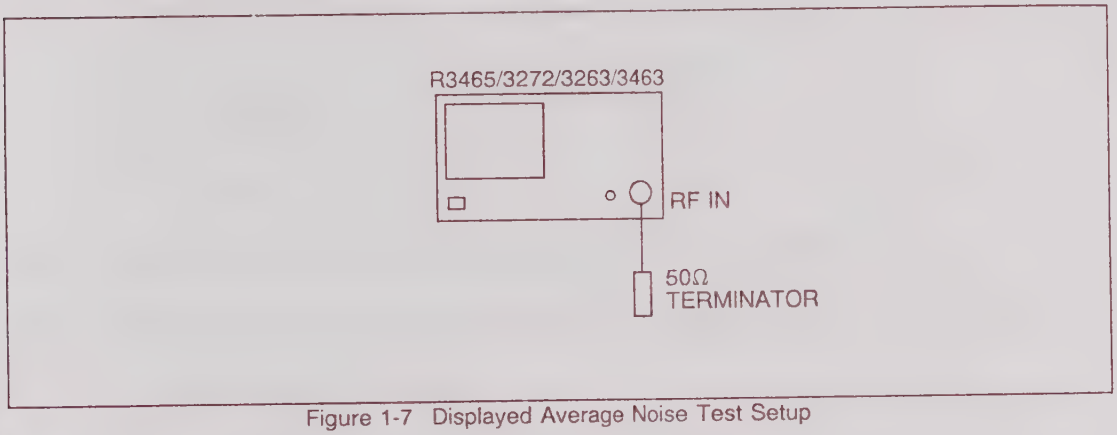

Figure 1-7 Displayed Average Noise Test Setup

- EQUIPMENT

  50 Ω Terminator

- PROCEDURE

[Displayed Average Noise, Band 0]

(1) Connect the equipment as shown in Figure 1-7.

Press [SHIFT] [▬], [PRESET] keys and set the controls as follows:

Center Frequency	10 kHz
Span Frequency	0 Hz
Reference Level	−60 dBm
Resolution Bandwidth	1 kHz
Video Bandwidth	1 Hz
Input Attenuator	0dB

(2) Press [SINGLE] key and wait for a new sweep to finish, then press [SRCH] key.

(3) Read the marker level and record it in Table 1-11 as the Displayed Noise Level at 10kHz.

(4) Press [FREQ], [1], [0], [0] and [kHz] keys.

(5) Press [SINGLE] key and wait for a new sweep to finish, then press [SRCH] key.

(6) Read the marker level and record it in Table 1-11 as the Displayed Noise Level at 100 kHz.

(7) For the R3465, press [FREQ], [more 1/2] and [Preselector] [1.7G] [3.0G] keys to set the preselector to 3.0 GHz.

(8) Change the center frequency to each of the values listed in column 1 of Table 1-11 and repeat step 5 sequentially. Read the marker level and record it in Table 1-11 as the Displayed Noise level at Center Frequency.

[Displayed Average Noise Level, Band 1 (R3465/3272)]

(9) Press SHIFT [—], PRESET [ ] keys and set the controls as follows:

Start Frequency	1.7 GHz (3.0GHz for R3272)
Stop Frequency	7.0 GHz (7.5 GHz for R3272)
Reference Level	−40 dBm
Resolution Bandwidth	3 MHz
Video Bandwidth	100 kHz
Input Attenuator	0 dB

(10) Press FORMAT [ ], [Trace], [AVG A], [1], [0], [Hz] keys and wait for averaging to finish.

(11) Press [→CF] and [WRITE A] keys.

(12) Set the controls as follows:

Span Frequency	0 Hz
Reference Level	−60 dBm
Resolution Bandwidth	1 kHz
Video Bandwidth	1 Hz

(13) Press [SINGLE] and [SRCH] keys.

(14) Read the marker level and record it in Table 1-11 as the Displayed Average Noise Level from 1.7 GHz (3.0 GHz for R3272) to 7.0 GHz (7.5 GHz for R3272).

[Displayed Average Noise Level, Band 2 (R3465/3272)]

(15) Press SHIFT [ ], PRESET [ ] and set the controls as follows:

Start Frequency	6.9 GHz (7.4 GHz for R3272)
Stop Frequency	8.0 GHz (15.4 GHz for R3272)
Reference Level	−40 dBm
Resolution Bandwidth	3 MHz
Video Bandwidth	100 kHz
Input Attenuator	0 dB

(16) Repeat steps (10) through (13).

(17) Read the marker level and record it in Table 1-11 as the Displayed Noise level from 6.9 GHz (7.4 GHz for R3272) to 8.0 GHz (15.4 GHz for R3272).

[Displayed Average Noise, Band 3 (R3272 only)]

(18) Press SHIFT [ ], PRESET [ ] and set the controls as follows:

Start Frequency	15.201 GHz
Stop Frequency	23.3 GHz
Reference Level	−40 dBm
Resolution Bandwidth	3 MHz
Video Bandwidth	100 kHz
Input Attenuator	0 dB

(19) Repeat steps (10) through (13).

(20) Read the marker level and record it in Table 1-11 as the Displayed Average Noise Level from 15.2 GHz to 23.3 GHz.

[Displayed Average Noise, Band 4 (R3272 only)]

(21) Press SHIFT [ ], PRESET [ ] and set the controls as follows:

Start Frequency	23.001 GHz
Stop Frequency	26.5 GHz
Reference Level	−40 dBm
Resolution Bandwidth	3 MHz
Video Bandwidth	100 kHz
Input Attenuator	0 dB

(22) Repeat steps (10) through (13).

(23) Read the marker level and record it in Table 1-11 as the Displayed Average Noise Level from 23 GHz to 26.5 GHz.

Table 1-11 Displayed Average Noise Level (R3465)

Frequency	Displayed Average Noise Level (dBm)	Specification (dBm)
10 kHz		−70.0
100 kHz		−80.0
1.1 MHz		−114.99
101 MHz		−114.84
501 MHz		−114.22
1001 MHz		−113.45
1501 MHz		−112.67
2001 MHz		−111.90
2501 MHz		−111.12
2999 MHz		−110.35
1.7 GHz to 7.0 GHz		−115.0
6.9 GHz to 8 GHz		−115.0

Table 1-11 Displayed Average Noise Level (R3272)

Frequency	Displayed Average Noise Level (dBm)	Specification (dBm)
10 kHz		−70.0
100 kHz		−80.0
1.1 MHz		−114.99
101 MHz		−114.84
501 MHz		−114.22
1001 MHz		−113.45
1501 MHz		−112.67
2001 MHz		−111.90
2501 MHz		−111.12
2999 MHz		−110.35
3.0 GHz to 7.5 GHz		−110.0
7.4 GHz to 15.4 GHz		−103.0
15.2 GHz to 23.3 GHz		−96.0
23 GHz to 26.5 GHz		−90.0

Table 1-11 Displayed Average Noise Level (R3263/3463)

Frequency	Displayed Average Noise Level (dBm)	Specification (dBm)
10 kHz		−70.0
100 kHz		−80.0
1.1 MHz		−114.99
101 MHz		−114.84
501 MHz		−114.22
1001 MHz		−113.45
1501 MHz		−112.67
2001 MHz		−111.90
2501 MHz		−111.12
2999 MHz		−110.35

1.4.8 Gain Compression

- SPECIFICATION
  −5 dBm (mixer level) > 10 MHz

- RELATED ADJUSTMENT
  There is no related adjustment procedure for this performance test.

- DESCRIPTION
  This test means gain compression in the low and high bands.
  Two signals, separated by 1 MHz, are used. First a −30 dBm signal is placed at the input of the R3465/3272/3263/3463.
  After that, input a signal at −5 dBm or above and increase its signal level. The initial signal level at −30 dBm is lowered. Measure the input level when the signal is lowered by 1 dB.

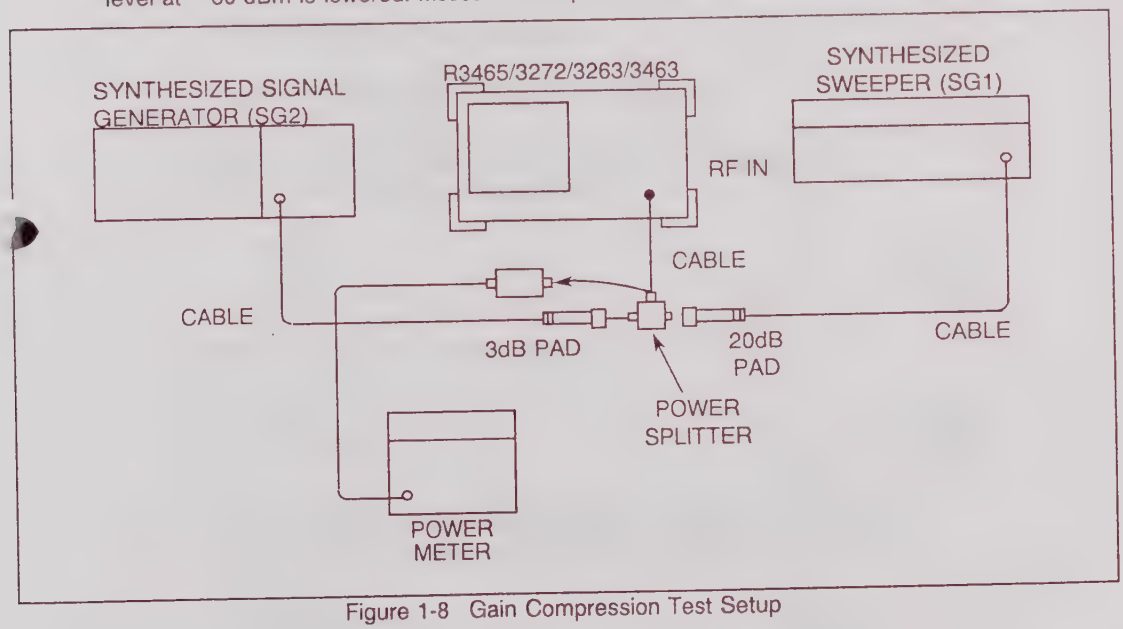

Figure 1-8 Gain Compression Test Setup

- EQUIPMENT

  Synthesized Sweeper (SG1)
  Synthesized Signal Generator (SG2)
  Power Meter
  Power Sensor (Sensor 1)
  Power Splitter
  20 dB Pad
  3 dB Pad
  Cable: SMA (Three required)

- PROCEDURE

(1) Zero and calibrate the power meter.

(2) Connect the equipment as shown in Figure 1-8.

(3) Press the INSTR PRESET by on both the SG1 and the SG2.
Set the controls for the SG2 as follows:

CW	821 MHz
Power Level	−2 dBm

(4) Set the controls for the SG1 as follows:

CW	820 MHz
Power Level	−4 dBm

(5) On the R3465/3272/3263/3463, press the SHIFT [ ] and PRESET [ ] keys.
Set the R3465/3272/3263/3463 controls as follows:

Center Frequency	820.5 MHz
Span	2 MHz
ATT	0 dB
dB/div	1 dB/div

(6) On the R3465/3272/3263/3463, press the [LEVEL], [3], [0] and [-dBm] keys.

(7) On the SG2, set the output to OFF.

(8) Adjust the power level of the SG1 for a displayed signal level of −30 dBm ± 0.1 dB on the R3465/3272/3263/3463 screen.

(9) On the SG2, set the output to ON.

(10) Turn the power level knob on the SG2 until the signal level at 2.5 div. in the lefthand part on the R3465/3272/3263/3463 screen is lowered by 1 dB from −30 dBm. If the power level knob cannot be turned any more, stop it there.

(11) Remove the SMA cable from the input terminal of the R3465/3272/3263 and connect the power sensor there.

(12) Record the amplitude reading on the power meter.
It should be greater than −5 dBm _____ dBm

The following steps are to be performed for the R3465 and R3272.

(13) Rotate the CAL FACTOR switch to the power sensor's 3.2 GHz calibration factor.
On the SG2, set the output to OFF.

(14) Set the SG2 controls as follows:

CW	3.201 GHz
Power Level	-2dBm

(15) Set the SG1 controls as follows:

CW	3.2 GHz

(16) Set the R3465/3272 controls as follows:

Center Freq	3.2005 GHz
Span	2 MHz
Ref Level	−10 dBm
dB/div	10 dB

(17) On the R3465/3272, press FREQ key, more 1/2, PRESELE and AUTO PEAKING keys.
Wait for the "peaking!!" message to disappear.
Set the dB/div to 1dB/div.

(18) Repeat steps (6) through (11).

(19) Record the amplitude reading on the power meter.
It should be greater than −5 dBm.

_____ dBm

Table 1-12 Gain Compression

R3465/3272/3263/3463 Center Freq (MHz)	SG1 CW (MHz)	SG2 CW (MHz)	1dB Gain Compression level (dBm)
820.5	820	821	
3200.5	3200	3201	

1.4.9 Residual Response

- SPECIFICATION

R3465:	1 MHz to 3.0 GHz < – 100 dBm 300 kHz to 8 GHz < – 90 dBm	(with no signal at input and 0 dB input attenuator. RF INPUT is terminated in 50 Ω.)
R3272:	1 MHz to 3.0 GHz < – 100 dBm 300 kHz to 26.5 GHz < – 90 dBm	
R3263/3463:	1 MHz to 3.0 GHz < – 100 dBm 300 kHz to 3.0 GHz < – 90 dBm	

- RELATED ADJUSTMENT
  There is no related adjustment for this performance test.

- DESCRIPTION
  This test checks for residual responses. Any response located above the display line is measured in a narrow frequency span and resolution bandwidth. The RF INPUT is terminated in 50 Ω.

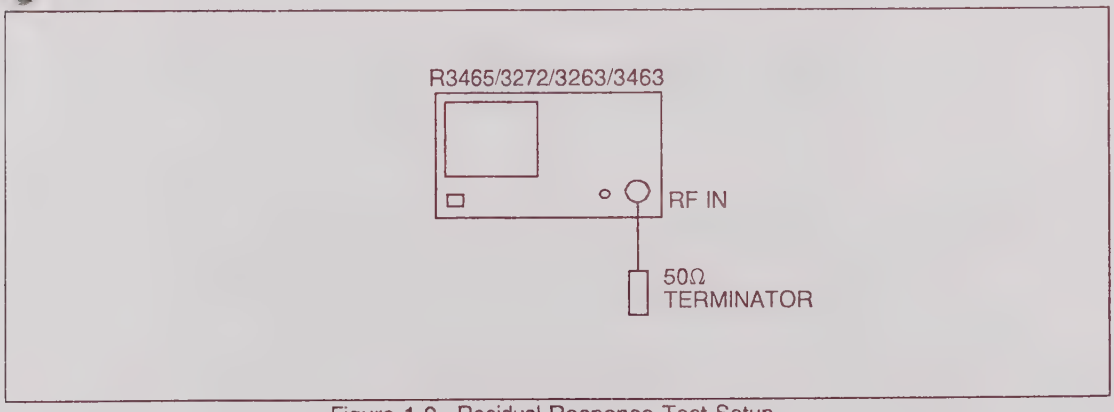

Figure 1-9 Residual Response Test Setup

- EQUIPMENT
  Coaxial 50 Ω Termination
  Adapters:
  Type N to SMA
  Type N to BNC
  Cable:
  BNC, 150cm

- PROCEDURE

(1) Install the Type N to SMA adapter and 50 Ω termination on the RF INPUT. Press the SHIFT [—], PRESET [ ] key and set the controls as follows:

Center Frequency	1.3 MHz
Span	2 MHz
CF Step	1.9 MHz
Ref Level	– 50 dBm
ATT	0 dB
RES BW	10 kHz
Video BW	300Hz

(2) For the R3465, press the [FREQ], [more 1/2] and [Preselector 1.7G 3.0G] to set the preselector to 3.0 GHz.

(3) Press the FORMAT [ ], [DSP LINE ON OFF], [1], [0], [0] and [-dBm] keys.
Press the [SINGLE] key.

The noise level should be at least 3 dB below the display line. If it is not, it will be necessary to reduce the Span and RES BW to reduce the noise level.
If the Span is reduced, reduce the CF Step to no more than 95 % of the Span.

(4) If a residual is suspected, press the [SINGLE] key again. A residual response will persist, but a noise peak will not. Record the frequency and amplitude of any responses above the display line.

(5) If a response is marginal, verify the response amplitude as follows:

① Press the [REPEAT] key.

② Place the marker on the peak of the response in question.

③ Press the [→CF] key.

④ Press the [BW] and [RBW / AUTO / MNL] keys to set the RBW to AUTO.

⑤ Continue to reduce the Span until a RES BW of 300 Hz is reached.

Press the [→CF] key.

⑥ Record the frequency and amplitude of any residual response above the display line.

(6) Check for residuals up to 3.0 GHz using the procedure of step (3) through (5) above. To change the center frequency, then press the [FREQ] and [◁△] keys.

< < Residual Response, 1.7 GHz (3.0 GHz for R3272) to 8.0 GHz (26.5 GHz for R3272) Band > >

(7) Set the R3465/3272 as follows:

Center Frequency	1.725 GHz (3.025 GHz for R3272)
Span	50 MHz
CF Step	47.5 MHz
RES BW	300 kHz
Video BW	300 Hz

Press the [DSP LINE ON/OFF], [9], [0], [-dBm] keys.

(8) For the R3465, press [FREQ], [more 1/2] and [Preselector / 1.7G / 3.0G] to set the preselector to 1.7 GHz.

(9) Check for residuals up to center frequency 7.975 GHz (26.475 GHz for the R3272) using the procedure of steps (3) through (5) above. To change the center frequency, then press the [FREQ] and [◁△] keys.

1.4.10 Second Harmonic Distortion

- SPECIFICATION

R3465: – 70 dBc (10 MHz to 3.0 GHz, – 30 dBm mixer level)
– 90 dBc (>1.7 GHz, – 10 dBm mixer level)

R3272: – 70 dBc (10 MHz to 3.0 GHz, – 30 dBm mixer level)
– 100 dBc (>3.0 GHz, – 10 dBm mixer level)

R3263/3463: – 70 dBc (10 MHz to 3.0 GHz, – 30 dBm mixer level)

- RELATED ADJUSTMENT
  There is no related adjustment procedure for the performance test.

- DESCRIPTION
  A synthesized sweeper and low-pass filter provide the signal for measuring second harmonic distortion. The low-pass filter eliminates any harmonic distortion originating at the signal source. The R3465/3272/3263/3463 frequency response is calibrated. The synthesized sweeper is phase-locked to the spectrum analyzer's 10 MHz reference.

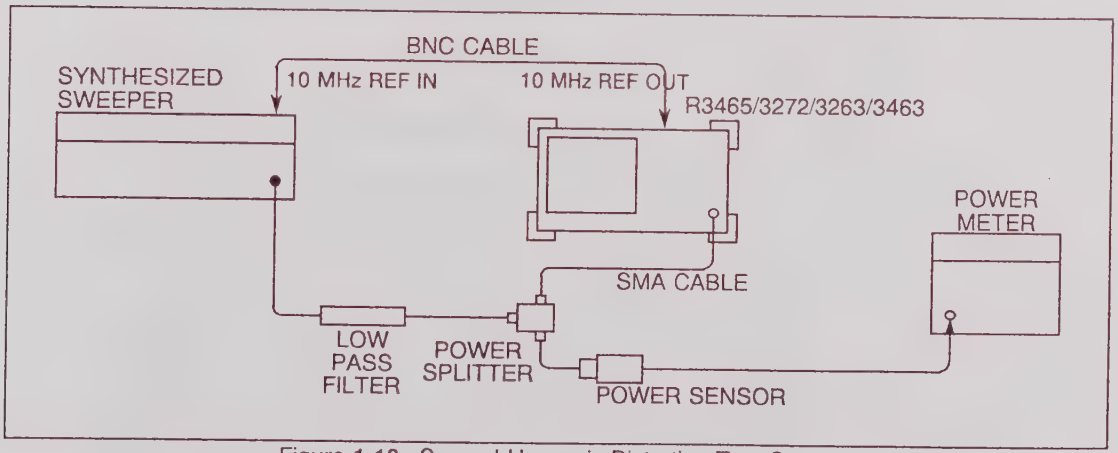

Figure 1-10 Second Harmonic Distortion Test Setup

- EQUIPMENT

Synthesized Sweeper (SG1)
Power Meter
Power Sensor
Power Splitter
2 GHz Low-pass Filter
Adapter:
    Type N to SMA
Cables:
    BNC, 150 cm
    SMA, 70 cm

- PROCEDURE

[9 kHz to 3.0 GHz Band]

(1) Zero and calibrate the power meter. Rotate the CAL FACTOR switch to the power sensor's 1.4 GHz calibration factor.

(2) Connect the equipment as shown in Figure 1-10.

(3) Press the [INSTR PRESET] key on the SG1. Set the SG1 controls as follows:

CW	1.4 GHz
Power Level	0 dBm
Frequency Standard Switch (rear panel)	EXT 10 MHz

(4) On the R3465/3272/3263/3463, press [SHIFT] , [PRESET] keys and set the controls as follows:

Center Frequency	1.4 GHz
Span	10 kHz
VBW	30 Hz
ATT	20 dB
Ref Level	– 10 dBm

(5) Set the SG1 [POWER LEVEL] key for a -10 dBm ± 0.1 dB reading on the power meter.

(6) For the R3465, press [FREQ] , [more 1/2] and [Preselector] [1.7G] [3.0G] to set the preselector to 3.0 GHz.

(7) On the R3465/3272/3263/3463, press [SINGLE], [SRCH], [MARKER ON], [Delta MKR], [more 1/3] and [FIXED MKR ON OFF] keys to set the FIXED MKR to ON.

(8) On the R3465/3272/3263/3463, press [FREQ], [2], [.], [8], [GHz] and [SINGLE] keys.
Wait for completion of the sweep.
Press [SRCH] and record the Δ MKR amplitude.
It should be less than -70 dBc.

Second Harmonic Distortion (<3.0 GHz)_____dBc

[>1.7 GHz (3.0 GHz for R3272) Band (R3465/3272)]

(9) On the R3465/3272, press [SHIFT] (−), [PRESET] keys and set the controls as follows:

Center Frequency	3.8 GHz
Span	500 kHz

(10) Set the SG1 controls as follows:

CW	3.8 GHz
Power Level	−10 dBm

(11) On the R3465/3272, press [FREQ], [more 1/2], [PRESELE] and [AUTO PEAKING] keys.
Wait for the "peaking" message to disappear.

(12) Set the SG1 controls as follows:

CW	1.9 GHz
Power Level	0 dBm

(13) Connect the equipment as shown in Figure 1-10.

(14) Rotate the CAL FACTOR switch to the power sensor's 1.9 GHz calibration factor.

(15) Set the SG1 [POWER LEVEL] key for a 0 dBm ±0.1 dB reading on the power meter.

(16) On the R3465/3272, press [FREQ], [1], [.], [9] and [GHz] keys.
Press [SPAN], [5] and [kHz] keys.

Press [SRCH], [MARKER ON], [Delta MKR] and [FIXED MKR ON OFF] to set the FIXED MKR to ON.

On the R3465/3272, press [FREQ], [3], [.], [8] and [GHz] keys.
Press [LEVEL], [4], [0] and [-dBm] keys.

Press [FORMAT], [Trace], [AVG A], [1], [0] and [Hz] keys.

Wait for the end of 10 averagings.
Press [SRCH] and record the Δ MKR amplitude.
It should be less than −100 dBc

Second Harmonic Distortion (>1.7 GHz (3.0 GHz for R3272))
_____dBc

1.4.11 Third Order Intermodulation Distortion

- SPECIFICATION

For a total mixer input level* of -30 dBm:

R3465	R3272	R3263/3463
10 MHz to 3.0 GHz : < – 75 dBc 1.7 GHz to 8 GHz : < – 75 dBc	10 MHz to 3.0 GHz : < – 75 dBc 3.0 GHz to 26.5 GHz : < – 75 dBc	10 MHz to 3.0 GHz : – 75 dBc

* Total mixer input level = Total Input Level - Input Attenuation

Converted Specification for a total mixer input level* of -20dBm:

R3465	R3272	R3263/3463
10 MHz to 3.0 GHz : < – 55 dBc 1.7 GHz to 8 GHz : < – 55 dBc	10 MHz to 3.0 GHz : < – 55 dBc 3.0 GHz to 26.5 GHz : < – 55 dBc	10 MHz to 3.0 GHz : – 55 dBc

- RELATED ADJUSTMENT

There is no related adjustment procedure for this performance test.

- DESCRIPTION

Two synthesized sweepers provide the signals required for measuring third order intermodulation.

It is difficult when the input level is low because of being buried to the noise, to measure the spectrum generated by the distortion. Third order intermodulation distortion is raised by 20 dB if the input level is raised by 10 dB.

Then, examine with mixer input level set in -20 dBm after the spec is converted into a value which is 20dB larger.

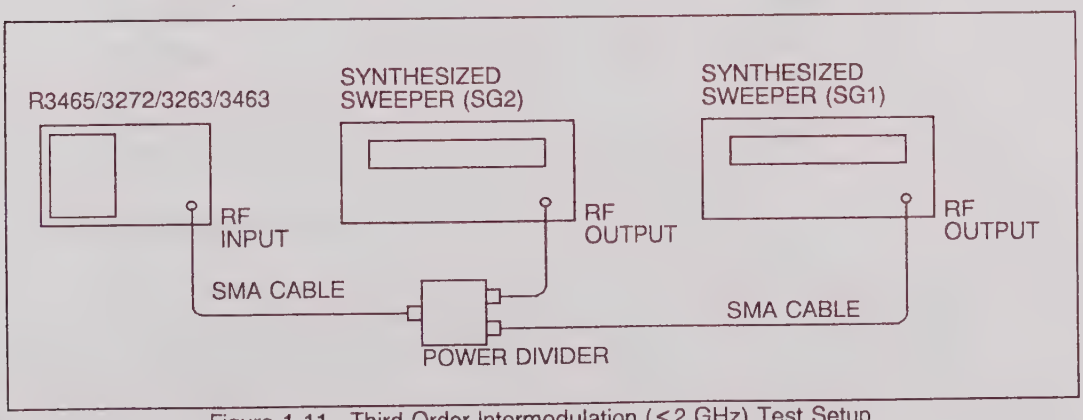

Figure 1-11 Third Order Intermodulation (<2 GHz) Test Setup

- EQUIPMENT

Synthesized Sweeper (SG1)
Synthesized Sweeper (SG2)
Power Divider #1 (Divider 1)
Power Divider #2 (Divider 2)
Cables:
SMA, 70cm (Three required)

- PROCEDURE

The following procedure carry out at -20dBm for a total mixer input level.

[Third Order Intermodulation (<2 GHz)]

(1) Select Divider 1 and connect the units as shown in Figure 1-11.

(2) Press the [INSTR PRESET] key on each synthesized sweeper. Set each of the synthesized sweeper controls as follows:

Power Level	– 10 dBm
CW (SG1)	820.0125 MHz
CW (SG2)	820.000 MHz
RF Output	OFF

(3) On the R3465/3272/3263/3463, press the [SHIFT] [–] and [PRESET] keys. Set the R3465/3272/3263/3463 controls as follows:

Center Frequency	820.005 MHz
Ref Level	– 10 dBm
Freq Span	50 kHz
RBW	300 Hz
VBW	300 Hz
ATT	10 dB

(4) On the SG1, set the output to ON.

(5) On the R3465/3272/3263/3463, press the MARKER [ON] , [Peak] and [CONT Peak] [ON] [OFF] to set the CONT Peak to ON.

(6) On the SG1, adjust the [POWER LEVEL] key for a – 10 dBm ± 0.1 dB reading on the R3465/3272/3263/3463 display.

(7) On the SG1, set the output to OFF. On the SG2, set the output to ON.

(8) On the SG2, adjust the [POWER LEVEL] key for a -10 dBm ± 0.1 dB reading on the R3465/3272/3263/3463 display.

(9) On the SG1, set the output to ON.

(10) On the R3465/3272/3263/3463, press the following keys: [CONT Peak] [ON] [OFF] to set the CONT Peak to OFF and the [SINGLE] keys.
Wait for a new sweep to finish.

Press the [SRCH] , MARKER [ON] and [Delta MKR] keys.

(11) Third order intermodulation distortions appear symmetrically 12.5 kHz apart from the two carriers. Move MKR to each distorted position with the knob or [◁△] key, read the level in dBc and record the greater reading.

[Third Order Intermodulation, 3.2 GHz (R3465/3272)]

(12) Change Divider 1 to 2.

(13) Press the [INSTR PRESET] key on each synthesized sweeper. Set each of the synthesized sweeper controls as follows:

Power Level	– 10 dBm
CW (SG1)	3.2000125 GHz
CW (SG2)	3.2 GHz
RF Output	OFF

(14) On the R3465/3272, press the SHIFT [ ] and PRESET [ ] keys. Set the R3465/3272 controls as follows:

Center Frequency	3.200005 GHz
Ref Level	– 10 dBm
Span	50 kHz
RBW	300 Hz
ATT	10 dB
VBW	300 HZ

(15) Repeat steps (4) to (11) to measure the third order intermodulation distortions and record the greater reading.

Table 1-13 Third Order Intermodulation Distortion

SG1 [CW] (MHz)	SG2 [CW] (MHz)	Third Order Intermodulation Distortion	
		Actual (dBc)	Max (dBc)
820.0125	820		-55
3200.0125	3200		-55

1.4.12 Image, Multiple and Out-of-Band Response

- SPECIFICATION

  Image, Multiple and Out-of-Band Response:

  R3465: – 70 dBc (10 MHz to 8 GHz)

  R3272: – 70 dBc (10 MHz to 18 GHz)
  – 60 dBc (10 MHz to 23 GHz)
  – 50 dBc (10 MHz to 26.5 GHz)

  Image and Multiple Response:

  R3263/3463: – 70 dBc (10 MHz to 3 GHz)

- RELATED ADJUSTMENT
  YTF adjustment

- DESCRIPTION
  The performance tests in the R3465, R3272 and R3263/3463 differ in measurement frequency. Make measurement with each band.

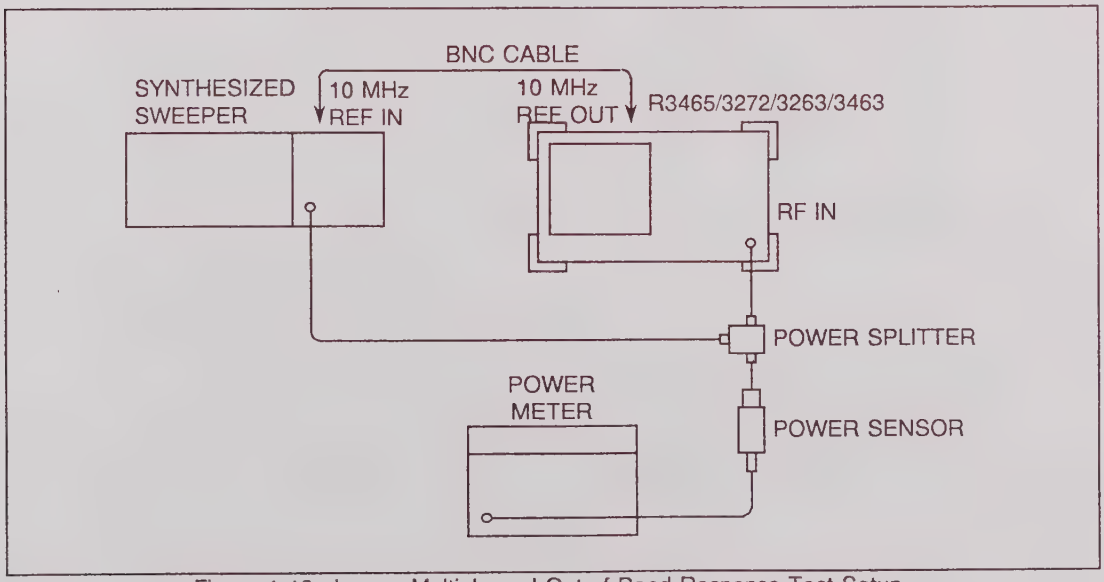

Figure 1-12 Image, Multiple and Out-of-Band Response Test Setup

- EQUIPMENT

Synthesized Sweeper (SG3)
Power Meter
Power Sensor (Sensor 1)
Power Splitter
Adapter:
    Type N to SMA
Cable:
    SMA, 70 cm

- PROCEDURE

[9 kHz to 3.0 GHz Band (R3465/3272/3263/3463)]

(1) Connect the equipment as shown in Figure 1-12, but do not connect the power sensor.

(2) Press the [INSTR PRESET] key on the SG3 and set the controls as follows:

CW	2 GHz
Power Level	0 dBm

(3) On the R3465/3272/3263/3463, press the [SHIFT] (blue), [PRESET] keys and set the controls as follows:

Center Frequency	2 GHz
Span	40 MHz
RBW	100 kHz
VBW	300 Hz

(4) Zero and calibrate the power meter. Rotate the CAL FACTOR switch to the power sensor's 2 GHz calibration factor.
Connect the power sensor to the power splitter.

(5) Adjust the SG3 [POWER LEVEL] key for a 0 dBm ±0.1 dB reading on the power meter.

(6) For the R3465, press [FREQ], [more 1/2] and [Preselector] [1.7G] [3.0G] to set the preselector to 3.0 GHz.

(7) On the R3465/3272/3263/3463, press [SPAN], [5], [MHz], [SINGLE], [SRCH], [MARKER ON], [Delta MKR] and [FIXED MKR ON OFF] to set the FIXED MKR to ON.

(8) For each of the frequencies listed in Table 1-14, 1-15 and 1-16 (Table1-14: R3272, Table 1-15: R3465, Table 1-16: R3263/3463) for the 9 kHz to 3.1 GHz band, do the following:

① Set the SG3 to the listed [CW] key frequency.

② On the power meter, rotate the CAL FACTOR switch to the appropriate power sensor calibration factor.

③ Set the SG3 [POWER LEVEL] key for a 0 dBm reading on the power meter.

④ Press [SINGLE] key on the R3465/3272/3263/3463.

⑤ On the R3465/3272/3263/3463, press [SRCH] key and record the ΔMKR amplitude in Table 1-14, 1-15 and 1-16 as the response amplitude. The response amplitude should be less than the specification listed in the table.

(9) On the R3465/3272/3263/3463, press the [MARKER ON], [MKR OFF] and [REPEAT] keys.

Measurement frequency for the R3465 is different for the following bands. Therefore, skip steps (10) to (28) and restart from step (29). The following steps are for the R3272.

[3.0 to 7.5 GHz Band (R3272 Only)]

(10) On the R3272, press [FREQ], [5], [.], [5] and [GHz] keys. Set the SG3 [CW] to 5.5 GHz.

(11) Rotate the CAL FACTOR switch to the power sensor's 5.5 GHz calibration factor on the power meter.

(12) On the SG3, set the power level to the power meter indicate 0dBm.
On the R3272, press [SPAN], [5], [MHz], [SRCH], [FREQ], [more 1/2], [PRESELE] and [AUTO PEAKING] keys. Wait for the "peaking!!" message to disappear.

Press [SINGLE], [SRCH], [MARKER ON], [Delta MKR] and [FIXED MKR ON OFF] to set the FIXED MKR to ON.

(13) Repeat steps (8) and (9) for the SG3 frequencies listed in Table 1-14 for the 3.0 GHz to 7.5 GHz band.

[7.4 GHz to 15.4 GHz Band (R3272 Only)]

(14) On the R3272, press the FREQ , 1 , 2 and GHz keys. Set the SG3 CW to 12 GHz.

(15) Rotate the CAL FACTOR switch to the power sensor's 12 GHz calibration factor on the power meter.

(16) Repeat step (12) for the R3272.

(17) Repeat steps (8) and (9) for the SG3 frequencies listed in Table 1-14 for the 7.4 GHz to 15.4 GHz band.

[15.2 GHz to 23.3 GHz Band (R3272 Only)]

(18) On the R3272, press the FREQ , 2 , 1 and GHz keys. Set the SG3 CW to 21 GHz.

(19) Rotate the CAL FACTOR switch to the power sensor's 21 GHz calibration factor on the power meter.

(20) Repeat step (12) for the R3272.

(21) Repeat steps (8) and (9) for the sweeper frequencies listed in Table 1-14 for the 15.2 to 23.3 GHz band.

[23 to 26.5 GHz Band (R3272 Only)]

(22) On the R3272, press the FREQ , 2 , 4 , . , 4 and GHz keys. Set the SG3 CW to 24.4 GHz.

(23) Rotate the CAL FACTOR switch to the power sensor's 24.4 GHz calibration factor on the power meter.

(24) Repeat step (12) for the R3272.

(25) Repeat steps (8) and (9) for the SG3 frequencies listed in Table 1-14 for the 23 to 26.5 GHz band.

(26) Record the maximum response amplitude from Table 1-14.
(At frequency less than 18 GHz)

Maximum Response Amplitude (< 18 GHz)_____dBc

(27) Record the maximum response amplitude from Table 1-14.
(At frequency ranging from 18 to 23 GHz)

Maximum Response Amplitude(< 23 GHz) _____dBc

(28) Record the maximum response amplitude from Table 1-14.
(At frequency ranging from 23 to 26 GHz)

Maximum Response Amplitude(< 26.5GHz) _____dBc

The following steps are for the R3465.

[1.7 to 8 GHz Band (R3465 Only)]

(29) Press [FREQ], [more 1/2] and [Preselector 1.7G 3.0G] keys to set the preselector to 1.7 GHz.

(30) On the R3465, press [FREQ], [6] and [GHz] keys. Set the SG3 [CW] to 6 GHz.

(31) Rotate the CAL FACTOR switch to the power sensor's 6 GHz calibration factor on the power meter.

(32) On the SG3, set the power level to the power meter indicate 0dBm.
On the R3465, press [SPAN], [5], [MHz], [SRCH], [FREQ], [more 1/2] and [AUTO PEAKING] keys. Wait for the "peaking!!" message to disappear.

Press [SINGLE], [SRCH], [MARKER ON], [Delta MKR] and [FIXED MKR ON OFF] keys to set the FIXED MKR to ON.

(33) Repeat steps (8) and (9) for the SG3 frequency listed in Table 1-15 for the 1.7 to 8 GHz band's 6 GHz center frequency.

(34) On the R3465, press [FREQ], [8] and [GHz] keys. Set the SG3 [CW] to 8 GHz.

(35) Rotate the CAL FACTOR switch to the power sensor's 8 GHz calibration factor on the power meter.

(36) Repeat step (32) for the R3465.

(37) Repeat steps (8) and (9) for the SG3 frequencies listed in Table 1-15 for the 1.7 to 8 GHz band's 8 GHz center frequency.

(38) Record the maximum response amplitude from Table 1-15.

Maximum Response Amplitude _____dBc

Table 1-14 Image, Multiple and Out-of-Band Responses (R3272)

Band	R3272 Center Freq. (GHz)	SG CW (MHz)	Response Amplitude (dBc)	Specification (dBc)
9 kHz to 3.1 GHz Band	2.0 2.0 2.0 2.0	1957.2 1157.2 10462.8 8231.4		−70 −70 −70 −70
3.0 GHz to 7.5 GHz Band	5.5 5.5 5.5 5.5	6342.8 11421.4 17342.8 23264.2		−70 −70 −70 −50
7.4 GHz to 15.4 GHz Band	12.0 12.0 12.0 12.0	12842.8 5789.3 18210.7 24421.4		−70 −70 −60 −50
15.2 GHz to 23.3 GHz Band	21.0 21.0 21.0	21842.8 6719.06 13859.53		−60 −70 −70
23 GHz to 26.5 GHz Band	24.4 24.4 24.4 24.4	25242.8 5783.95 11989.3 18194.65		−60 −70 −70 −60

Table 1-15 Image, Multiple and Out-of-Band Responses (R3465)

Band	R3465 Center Freq. (GHz)	SG CW (MHz)	Response Amplitude (dBc)	Specification (dBc)
9 kHz to 3.0 GHz Band	2.0 2.0 2.0 2.0	1957.2 1157.2 10462.8 8231.4		−70 −70 −70 −70
1.7 GHz to 8 GHz Band	6.0 8.0 8.0	6842.8 4632.1 3789.3		−70 −70 −70

Table 1-16 Image and Multiple Responses (R3263/3463)

Band	R3263/3463 Center Freq. (GHz)	SG CW (MHz)	Response Amplitude (dBc)	Specification (dBc)
9 kHz to 3.0 GHz Band	2.0 2.0	1957.2 1157.2		−70 −70

1.4.13 Frequency Response

- SPECIFICATION

R3465:
- ± 1.5 dB (9 kHz to 3.0 GHz) (10 dB Input Attenuator)
- ± 1.0 dB (50 MHz to 3.0 GHz)
- ± 1.5 dB (1.7 GHz to 7.0 GHz)
- ± 1.5 dB (6.9 GHz to 8 GHz)

R3272:
- ± 1.5 dB (9 kHz to 3.1 GHz)
- ± 1.0 dB (50 MHz to 3.1 GHz)
- ± 1.5 dB (3.0 GHz to 7.5 GHz)
- ± 3.5 dB (7.4 GHz to 15.4 GHz)
- ± 4.0 dB (15.4 GHz to 23.3 GHz)
- ± 4.0 dB (23 GHz to 26.5 GHz)

R3263/3463:
- ± 1.5 dB (9 kHz to 3.0 GHz)
- ± 1.0 dB (50 MHz to 3.0 GHz)

Frequency response relative to the calibrator (30 MHz):

R3465:	± 3 dB (9 kHz to 8 GHz)
R3272:	± 5 dB (9 kHz to 26.5 GHz)
R3263/3463:	± 2 dB (9 kHz to 3 GHz)

- RELATED ADJUSTMENT

YTF adjustment.
Frequency response adjustment.

- DESCRIPTION

The SG3 signal is fed through a power splitter to a power sensor and the R3465/3272/3263/3463. The SG3's power level is adjusted at 30 MHz to place the displayed signal at the R3465/3272/3263/3463 center horizontal graticule line. The power meter is placed in RATIO mode. At each new SG3 frequency, the SG3's power level is adjusted to the center horizontal graticule line. The power meter displays the inverse of the frequency response relative to the calibrator.

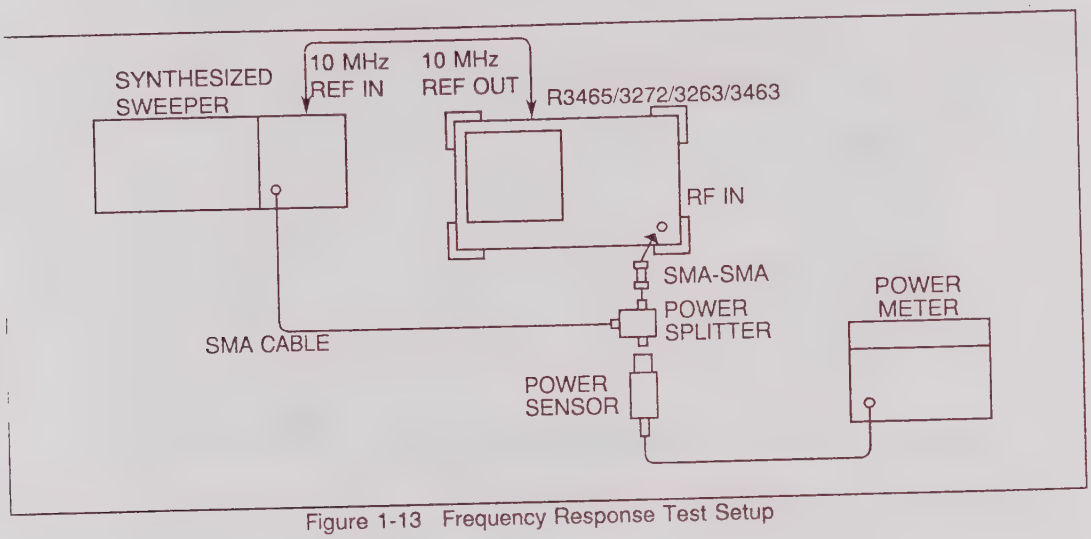

Figure 1-13 Frequency Response Test Setup

- EQUIPMENT

Synthesized Sweeper (SG3)
Power Meter
Power Sensor (Sensor 1)
Power splitter
Adapter:
    Type N to SMA
    SMA (m) to SMA (m)
Cables:
    SMA, 70 cm (Two required)

- PROCEDURE

(1) Zero and calibrate the power meter.

(2) Connect the equipment as shown in Figure 1-13.

(3) Press the [INSTR PRESET] key on the SG3. Set the SG3 controls as follows:

CW	30 MHz
Freq Step	100 MHz
Power Level	– 4 dBm

(4) On the R3465/3272/3263/3463, press the SHIFT [ ] and PRESET [ ] keys.

Center Frequency	30 MHz
CF Step	100 MHz
Span	5 MHz
Ref Level	– 5 dBm
dB/div	2 dB/div
RBW	300 kHz
VBW	100 Hz
Trace Detector	Posi

(5) Press MARKER [ON], [Peak] and [CONT Peak ON OFF] keys to set the CONT PEAK to ON.

(6) Adjust the SG3 POWER LEVEL for a MKR amplitude reading of – 10 dBm ± 0.09 dB.

(7) Press the [dB [REF]] switch on the power meter.

[Frequency Response (R3465/3272/3263/3463: 9 kHz to 3.0 GHz Band)]

(8) Set the SG3 [CW] to 100 MHz.

(9) For the R3465, press [FREQ], [more 1/2] and [Preselector 1.7G 3.0G] to set the preselector to 3.0 GHz.

(10) On the R3465/3272/3263/3463, press [FREQ], [1], [0], [0] and [MHz] keys.

(11) Adjust the SG3 POWER LEVEL for an R3465/3272/3263/3463 MKR amplitude reading of – 10 dBm ± 0.09 dB.

(12) Record the reverse sign value of the power ratio displayed on the power meter in Table 1-17.

(13) On the SG3, press the [CW] and up keys.
On the R3465/3272/3263/3463, press the [FREQ] and ⇦ keys.
At each new frequency, repeat steps (11) and (12), rotating the CAL FACTOR switch to the power sensor's calibration factor.

[Frequency Response (R3465: 1.7 to 7.0 GHz Band) (R3272: 3.0 to 7.5 GHz Band)]

(14) For the R3465, press [FREQ], [more 1/2] and [Preselector 1.7G 3.0G] to set the preselector to 1.7 GHz.

(15) On the R3465/3272, press [FREQ], [1], [.], [8] and [GHz] keys.
([3], [.], [1] for R3272)

(16) Set the SG3 [CW] to 1.8 GHz. (3.1 GHz for R3272)

(17) On the R3465/3272, press [SRCH], [FREQ], [more 1/2], [PRESELE] and [AUTO PEAKING] keys.
Wait for the "peaking!!" message to disappear.

(18) Adjust the SG3 POWER LEVEL for an R3465/3272 MKR amplitude reading of −10 dBm ±0.09 dB.

(19) Record the reverse sign value of the power ratio displayed on the power meter in Table 1-18 and 1-19.

(20) On the SG3, press the [CW] and up keys.
On the R3465/3272, press the [FREQ] and ⇦ keys.
At each new frequency, repeat steps (17) through (19), rotating the CAL FACTOR switch to the power sensor's calibration factor.

[Frequency Response (R3465: 6.9 to 8.0 GHz Band) (R3272: 7.4 to 15.4 GHz Band)]

(21) On the R3465/3272, press [FREQ], [7], [.], [0] and [GHz] keys.
([7], [.], [5] for R3272)

Press [FREQ] and [CF STEP] [AUTO] [MNL] to set the CF STEP to MNL.

Press [2], [0], [0] and [MHz] keys.

(22) Set the SG3 [CW] to 7.0 GHz (7.5 GHz for R3272) and [CF STEP SIZE] to 200 MHz.

(23) On the R3465/3272, press [SRCH], [FREQ], [more 1/2], [PRESELE] and [AUTO PEAKING] keys.
Wait for the "peaking!!" message to disappear.

(24) Adjust the SG3 POWER LEVEL for an R3465/3272 MKR amplitude reading of −10 dBm ±0.09 dB.

(25) Recording the reverse sign value of the power ratio displayed on the power meter in Table 1-20 and 1-21.

(26) On the SG3, press the [CW] and up keys.
On the R3465/3272, press the [FREQ] and keys.
At each new frequency, repeat steps (23) through (25), rotating the CAL FACTOR switch to the power sensor's calibration factor.

[Frequency Response (R3272: 15.2 to 23.3 GHz Band)]

(27) On the R3272, press [FREQ], [1], [5], [.], [4] and [GHz] keys.

(28) Set the SG3 [CW] to 15.4 GHz.

(29) On the R3272, press [SRCH], [FREQ], [more 1/2], [PRESELE] and [AUTO PEAKING] keys.
Wait for the "peaking!!" message to disappear.

(30) Adjust the SG3 POWER LEVEL for an R3272 MKR amplitude reading of −10 dBm ±0.09 dB.

(31) Record the negative value of the power ratio displayed on the power meter in Table 1-22.

(32) On the SG3, press the [CW] and up keys.
On the R3272, press the [FREQ] and [△] keys.
At each new frequency, repeat steps (29) through (31), rotating the CAL FACTOR switch to the power sensor's calibration factor.

[Frequency Response (R3272:23 to 26.5 GHz Band)]

(33) On the R3272, press [FREQ], [2], [3], [.], [4] and [GHz] keys.

(34) Set the SG3 [CW] to 23.4 GHz.

(35) On the R3272, press [SRCH], [FREQ], [more 1/2], [PRESELE] and [AUTO PEAKING] keys.
Wait for the "peaking!!" message to disappear.

(36) Adjust the sweeper POWER LEVEL for an R3272 MKR amplitude reading of −10 dBm ±0.09 dB.

(37) Record the reverse sign value of the power ratio displayed on the power meter in Table 1-23.

(38) On the SG3, press the [CW] and up keys.
On the R3272, press the [FREQ] and [△] keys.
At each new frequency, repeat steps (35) through (37), rotating the CAL FACTOR switch to the power sensor's calibration factor.

[Test Results]

(40) Frequency Response (R3465/3272/3263/3463:9 kHz to 3.0 GHz Band)

① Enter the most positive number from Table 1-17, Power Meter Reading :_____dB
The absolute value of this number should be less than 5 dB.

② Enter the most negative number from Table 1-17, Power Meter Reading:_____dB
The absolute value of this number should be less than 5 dB.

③ Subtract ② from ①: _____dB
The result should be less than 3 dB.

(41) Frequency Response (R3465/3272/3263/3463:50 MHz to 3.0 GHz Band)

① Enter most positive number from Table 1-17, Power Meter Reading within the range of 100 MHz to 3.0 GHz frequency: _____dB

② Enter most negative number from Table 1-17, Power Meter Reading within the range of 100 MHz to 3.0 GHz frequency: _____dB

③ Subtract ② from ①: _____dB
The result should be less than 2 dB.

(42) Frequency Response (R3465: 1.7 GHz to 7.0 GHz Band)
(R3272: 3.0 GHz to 7.5 GHz Band)

① Enter the most positive number from Table 1-18 and 1-19, Power Meter Reading: _____dB
The absolute value of this number should be less than 5 dB.

② Enter the most negative number from Table 1-18 and 1-19, Power Meter Reading: _____dB
The absolute value of this number should be less than 5 dB.

③ Subtract ② from ①: _____dB
The result should be less than 3 dB.

(43) Frequency Response (R3465:6.9 to 8 GHz Band)(R3271:7.4 to 15.4 GHz Band)

① Enter the most positive number from Table 1-20 and 1-21, Power Meter Reading:
_____dB

The absolute value of this number should be less than 5 dB.

② Enter the most negative number from Table 1-20 and 1-21, Power Meter Reading:
_____dB

The absolute value of this number should be less than 5 dB.

③ Subtract ② from ①: _____dB
The result should be less than 7 dB (R3465:3 dB).

(44) Frequency Response (R3272:15.2 to 23.3 GHz Band)

① Enter the most positive number from Table 1-22, Power Meter Reading:_____dB
The absolute value of this number should be less than 5 dB.

② Enter the most negative number from Table 1-22, Power Meter Reading:_____dB
The absolute value of this number should be less than 5 dB.

③ Subtract ② from ①: _____dB
The result should be less than 8 dB.

(45) Frequency Response (R3272:23 to 26.5 GHz Band)

① Enter the most positive number from Table 1-23, Power Meter Reading:_____dB
The absolute value of this number should be less than 5 dB.

② Enter the most negative number from Table 1-23, Power Meter Reading:_____dB
The absolute value of this number should be less than 5 dB.

③ Subtract ② from ①: _____dB
The result should be less than 8 dB.

Table 1-17 Frequency Response
(R3465/3272/3263/3463 : 9 kHz to 3.0 GHz Band)

Column 1	Column 2	Column 3
Frequency (MHz)	Power Meter Reading (dB)	CAL Factor Freq. (GHz)
100		0.05
200		0.05
300		0.05
400		0.05
500		0.05
600		0.05
700		0.05
800		0.05
900		0.05
1000		1.0
1100		1.0
1200		1.0
1300		1.0
1400		1.0
1500		1.0
1600		1.0
1700		1.0
1800		1.0
1900		1.0
2000		2.0
2100		2.0
2200		2.0
2300		2.0
2400		2.0
2500		2.0
2600		2.0
2700		2.0
2800		2.0
2900		2.0
3000		3.0

Table 1-18 Frequency Response (R3465 : 1.7 GHz to 7.0 GHz Band)

Column 1	Column 2	Column 3
Frequency (GHz)	Power Meter Reading (dB)	CAL Factor Freq. (GHz)
1.7		1.0
1.8		1.0
1.9		1.0
2.0		2.0
2.1		2.0
2.2		2.0
2.3		2.0
2.4		2.0
2.5		2.0
2.6		2.0
2.7		2.0
2.8		2.0
2.9		2.0
3.0		3.0
3.1		3.0
3.2		3.0
3.3		3.0
3.4		3.0
3.5		3.0
3.6		3.0
3.7		3.0
3.8		3.0
3.9		3.0
4.0		4.0
4.1		4.0
4.2		4.0
4.3		4.0
4.4		4.0
4.5		4.0
4.6		4.0
4.7		4.0
4.8		4.0
4.9		4.0
5.0		5.0
5.1		5.0
5.2		5.0
5.3		5.0
5.4		5.0
5.5		5.0
5.6		5.0
5.7		5.0
5.8		5.0

Column 1	Column 2	Column 3
Frequency (GHz)	Power Meter Reading (dB)	CAL Factor Freq. (GHz)
5.9		5.0
6.0		6.0
6.1		6.0
6.2		6.0
6.3		6.0
6.4		6.0
6.5		6.0
6.6		6.0
6.7		6.0
6.8		6.0
6.9		6.0
7.0		7.0

Table 1-19 Frequency Response
(R3272 : 3.0 GHz to 7.5 GHz Band)

Column 1	Column 2	Column 3
Frequency (GHz)	Power Meter Reading (dB)	CAL Factor Freq. (GHz)
3.0		3.0
3.1		3.0
3.2		3.0
3.3		3.0
3.4		3.0
3.5		3.0
3.6		3.0
3.7		3.0
3.8		3.0
3.9		3.0
4.0		4.0
4.1		4.0
4.2		4.0
4.3		4.0
4.4		4.0
4.5		4.0
4.6		4.0
4.7		4.0
4.8		4.0
4.9		4.0
5.0		5.0
5.1		5.0
5.2		5.0
5.3		5.0
5.4		5.0
5.5		5.0
5.6		5.0
5.7		5.0
5.8		5.0
5.9		5.0
6.0		6.0
6.1		6.0
6.2		6.0
6.3		6.0
6.4		6.0
6.5		6.0
6.6		6.0
6.7		6.0
6.8		6.0
6.9		6.0
7.0		7.0
7.1		7.0
7.2		7.0
7.3		7.0
7.4		7.0

Table 1-20 Frequency Response
(R3465 : 6.9 GHz to 8 GHz Band)

Column 1	Column 2	Column 3
Frequency (GHz)	Power Meter Reading (dB)	CAL Factor Freq. (GHz)
6.9		6.0
7.1		7.0
7.3		7.0
7.5		7.0
7.7		7.0
7.9		7.0

Table 1-21 Frequency Response
(R3272 : 7.4 GHz to 15.4 GHz Band)

Column 1	Column 2	Column 3
Frequency (GHz)	Power Meter Reading (dB)	CAL Factor Freq. (GHz)
7.5		7.0
7.7		7.0
7.9		7.0
8.1		8.0
8.3		8.0
8.5		8.0
8.7		8.0
8.9		8.0
9.1		9.0
9.3		9.0
9.5		9.0
9.7		9.0
9.9		9.0
10.1		10.0
10.3		10.0
10.5		10.0
10.7		10.0
10.9		10.0
11.1		11.0
11.3		11.0
11.5		11.0
11.7		11.0
11.9		11.0
12.1		12.0
12.3		12.0
12.5		12.0
12.7		12.0
12.9		12.0
13.1		13.0
13.3		13.0
13.5		13.0
13.7		13.0
13.9		13.0
14.1		14.0
14.3		14.0
14.5		14.0
14.7		14.0
14.9		14.0
15.1		15.0
15.3		15.0

Table 1-22 Frequency Response
(R3272 : 15.2 GHz to 23.3 GHz Band)

Column 1	Column 2	Column 3
Frequency (GHz)	Power Meter Reading (dB)	CAL Factor Freq. (GHz)
15.4		15.0
15.6		15.0
15.8		15.0
16.0		16.0
16.2		16.0
16.4		16.0
16.6		16.0
16.8		16.0
17.0		17.0
17.2		17.0
17.4		17.0
17.6		17.0
17.8		17.0
18.0		18.0
18.2		18.0
18.4		18.0
18.6		18.0
18.8		18.0
19.0		19.0
19.2		19.0
19.4		19.0
19.6		19.0
19.8		19.0
20.0		20.0
20.2		20.0
20.4		20.0
20.6		20.0
20.8		20.0
21.0		21.0
21.2		21.0
21.4		21.0
21.6		21.0
21.8		21.0
22.0		22.0
22.2		22.0
22.4		22.0
22.6		22.0
22.8		22.0
23.0		23.0
23.2		23.0

Table 1-23 Frequency Response
(R3272 : 23 GHz to 26.5 GHz Band)

Column 1	Column 2	Column 3
Frequency (GHz)	Power Meter Reading (dB)	CAL Factor Freq. (GHz)
23.4		23.0
23.6		23.0
23.8		23.0
24.0		24.0
24.2		24.0
24.4		24.0
24.6		24.0
24.8		24.0
25.0		25.0
25.2		25.0
25.4		25.0
25.6		25.5
25.8		25.5
26.0		26.0
26.2		26.0
26.4		26.0

1.4.14 IF Gain Uncertainty

- SPECIFICATION

  IF Gain Uncertainty:
  < ±0.5 dB, reference levels 0 dBm to −50 dBm with 10 dB input attenuation

- RELATED ADJUSTMENT
  IF amplitude adjustment.

- DESCRIPTION
  This test measures IF gain error in resolution band width 10 kHz and 3 kHz. The input signal level is decreased as the spectrum analyzer's reference level is decreased (IF gain increased). Since the signal level is decreased in precise steps, any error between the reference level and the signal level is caused by the analyzer's IF gain. The Synthesized Level Generator is phase-looked to the analyzer's 10 MHz reference.

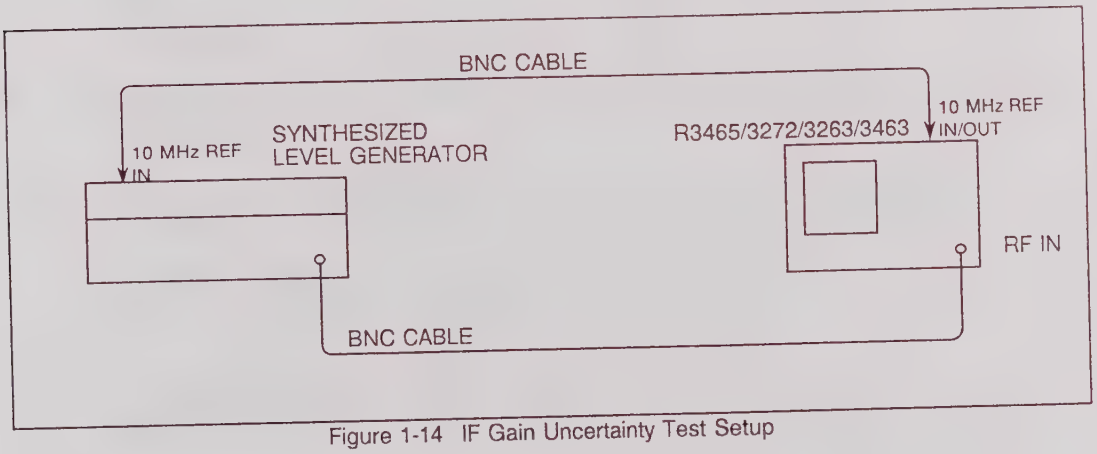

Figure 1-14 IF Gain Uncertainty Test Setup

- EQUIPMENT

  Synthesized Level Generator (SG4)
  Cables:
  BNC, 150 cm (Two required)

- PROCEDURE

(1) Connect the equipment as shown in Figure 1-14.

(2) Set the SG4 controls as follows:

Frequency	30 MHz
Amplitude	−5 dBm

(3) On the R3465/3272/3263/3463, press the SHIFT [ ] and PRESET [ ] keys and set the controls as follows:

Center Frequency	30 MHz
Frequency Span	0 Hz
REF LEVEL	0 dBm
dB/div	1 dB/div
VBW	1 Hz
RBW	10 kHz
Trace Detector	Posi

(4) Set the output level of the SG4 to the value 5 dB lower than the R3465/3272/3263/3463 reference level.

(5) After several sweeps in the R3465/3272/3263/3463, press the [SINGLE] and [SRCH] keys to read the data on the screen and record it as the reference value. Then, press the MARKER [ON], [Delta MKR] and FIXED MKR [ON] [OFF] to set the FIXED MKR to ON.

(6) Lower the SG4 level and the R3465/3272/3263/3463 reference level by 1 dB. Press [SINGLE] key.

(7) Press the [SRCH] key to read the marker level on the screen and record it in Table 1-24.

(8) Repeat steps (6) and (7) until the SG4 is lowered to 10 dB.

(9) Lower the SG4 level and the R3465/3272/3263/3463 reference level by 10 dB.

(10) Press the [SRCH] key to read the data on the screen and record it in Table 1-24.

(11) Repeat steps (9) and (10) until the SG4 is lowered to 50 dB.

(12) Repeat steps (2) to (11) above for the R3465/3272/3263/3463 resolution band width 3 kHz. For resolution band width 3 kHz, record the result in Table 1-25.

Table 1-24 IF Gain Error (RBW = 10 kHz, 1 dB/div.)

Reference value (dBm)

R3465/3272/3263/3463 Reference Level (dBm)	SG4 (dBm)	△ Marker Level (dB)	Specification
0	-5	0 (Ref.)	–
−1	-6		±0.5 dB
−2	-7		±0.5 dB
−3	-8		±0.5 dB
−4	-9		±0.5 dB
−5	-10		±0.5 dB
−6	-11		±0.5 dB
−7	-12		±0.5 dB
−8	-13		±0.5 dB
−9	-14		±0.5 dB
−10	-15		±0.5 dB
−20	-25		±0.5 dB
−30	-35		±0.5 dB
−40	-45		±0.5 dB
−50	-55		±0.5 dB

Table 1-25 IF Gain Error (RBW = 3 kHz, 1 dB/div.)

Reference value (dBm)

R3465/3272/3263/3463 Reference Level (dBm)	SG4 (dBm)	△ Marker Level (dB)	Specification
0	-5	0 (Ref.)	–
−1	-6		±0.5 dB
−2	-7		±0.5 dB
−3	-8		±0.5 dB
−4	-9		±0.5 dB
−5	-10		±0.5 dB
−6	-11		±0.5 dB
−7	-12		±0.5 dB
−8	-13		±0.5 dB
−9	-14		±0.5 dB
−10	-15		±0.5 dB
−20	-25		±0.5 dB
−30	-35		±0.5 dB
−40	-45		±0.5 dB
−50	-55		±0.5 dB

1.4.15 Scale Fidelity

- SPECIFICATION

  Log Scale Fidelity: ± 0.2 dB/1 dB,
  ± 1 dB/10 dB to a maximum of ± 1.5 dB over 0 to 80 dB range.
  Linear Scale Fidelity: < ± 15% of reference level

- RELATED ADJUSTMENT
  IF amplitude adjustment.

- DESCRIPTION
  This test measures display accuracy for 1 dB, 10 dB log scales, X1 linear scales. All scales are measured with 0 dBm reference signal. Figure 1-15 illustrates the measurement system of this test. The Synthesized Level Generator is phase-locked to the 10 MHz reference source of the spectrum analyzer.

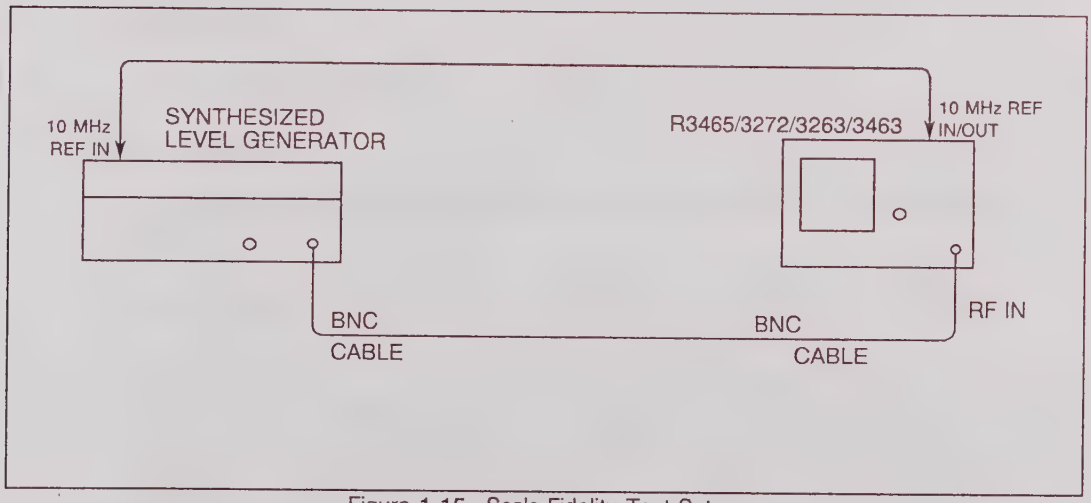

Figure 1-15 Scale Fidelity Test Setup

- EQUIPMENT

  Synthesized Level Generator (SG4)
  Cables:
  BNC, 150 cm (Two required)

- PROCEDURE

(1) Connect the equipment as shown in Figure 1-15.

(2) Set the SG4 controls as follows:

Frequency	30 MHz
Amplitude	0 dBm

(3) On the R3465/3272/3263/3463, press the SHIFT [ ] and PRESET [ ] keys and set the controls as follows:

Center Frequency	30 MHz
Freq Span	0 Hz
Ref Level	0 dBm
RBW	3 kHz
VBW	1 Hz
dB/div	1 dB/div
Trace Detector	Posi

(4) On the R3465/3272/3263/3463, press the MARKER [ON].

[1 dB/div Log Scale]

(5) On the SG4, adjust the amplitude until the R3465/3272/3263 marker reads exactly 0.00 dBm.

(6) On the R3465/3272/3263/3463, press the FORMAT [ ], [Trace], [Trace B] and [Store B] keys.

(7) On the R3465/3272/3263/3463, press the MARKER [ON], [more 1/3], [more 2/3], [Trace MKR Move], [more 3/3], [Delta MKR], [more 1/3], [more 2/3] and [Trace MKR Move] keys.

(8) On the R3465/3272/3263/3463, press the [SINGLE] key.

(9) Lower the SG4 level by 1 dB.

(10) On the R3465/3272/3263/3463, press the [SINGLE] key.

(11) Record the Delta marker level in the Actual column in Table 1-26. Calculate the incremental error according to the following equation and record the result in the Incremental Error column in Table 1-26.

Incremental error = (Current Delta marker level) - (Previous Delta marker level) + 1 dB

(12) Repeat steps (9) to (11) until the SG4 level is set to the value 10 dB lower than the initially set level.

[10 dB/div Log Scale]

(13) On the R3465/3272/3263/3463, press the [REPEAT], [LEVEL], [dB/div] and [10 dB/div] keys.

(14) Set the SG4 level so that the R3465/3272/3263/3463 marker indicates just 0.00 dBm.

(15) On the R3465/3272/3263/3463, press the [FORMAT], [Trace], [Trace B] and [Store B] keys.

(16) On the R3465/3272/3263/3463, press the [MARKER] [ON], [more 1/3], [more 2/3], [Trace MKR Move], [more 3/3], [Delta MKR], [more 1/3], [more 2/3] and [Trace MKR Move] keys.

(17) Lower the SG4 level by 10 dB.

(18) On the R3465/3272/3263/3463, press the [SINGLE] key.

(19) Record the Delta marker level in the Actual column in Table 1-27. Calculate the incremental error from the following expression and record the result in the Incremental Error column in Table 1-27.

Incremental error = (Current Delta marker level) - (Previous Delta marker level) + 10 dB

(20) Repeat steps (17) to (19) until the frequency synthesizer level is set to the value 80 dB lower than the initially set level.

Table 1-26 1 dB/div. Log Scale Fidelity (RBW = 3 kHz)

Input Signal Level (dBm, nominal)	dB from Reference Level (nominal)	Δ Marker Level			Incremental Error (dB)
		Min. (dBm)	Actual (dBm)	Max. (dBm)	
0	0	0	0 (Ref.)	0	0 (Ref.)
−1	−1	−1.2		−0.8	
−2	−2	−2.4		−1.6	
−3	−3	−3.6		−2.4	
−4	−4	−4.8		−3.2	
−5	−5	−6.0		−4.0	
−6	−6	−7.2		−4.8	
−7	−7	−8.4		−5.6	
−8	−8	−9.5		−6.5	
−9	−9	−10.5		−7.5	
−10	−10	−11.5		−8.5	

Table 1-27 10 dB/div. Log Scale Fidelity (RBW = 3 kHz)

Input Signal Level (dBm, nominal)	dB from Reference Level (nominal)	Δ Marker Level			Incremental Error (dB)
		Min. (dBm)	Actual (dBm)	Max. (dBm)	
0	0	0	0 (Ref.)	0	0 (Ref.)
−10	−10	−11		−9	
−20	−20	−21.5		−18.5	
−30	−30	−31.5		−28.5	
−40	−40	−41.5		−38.5	
−50	−50	−51.5		−48.5	
−60	−60	−61.5		−58.5	
−70	−70	−71.5		−68.5	
−80	−80	−81.5		−78.5	

[Linear Scale]

(21) Set the SG4 as follows:

Frequency	30 MHz
Amplitude	0 dBm

(22) On the R3465/3272/3263/3463, press the SHIFT [ ] and PRESET [ ] keys and set the controls as follows:

Center Freq	30 MHz
Freq Span	0 kHz
Ref Level	0 dBm
RBW	3 kHz
VBW	1 kHz
Trace Detector	Posi

(23) On the R3465/3272/3263/3463, press the [LEVEL], [LINEAR] and [X1] keys to select the linear X1 mode. Then, press the MARKER [ON] key.

(24) Precisely set the SG4 level to the R3465/3272/3263/3463 reference level while reading the marker level on the screen.

(25) On the R3465/3272/3263/3463, press the [SINGLE] key to set the single sweep mode.

(26) Read the level value displayed on the SG4 and set the value as the reference value (Ref). Then, set the frequency synthesizer level to the value 0.92 dB lower than the reference value.

(27) On the R3465/3272/3263/3463, perform single sweep, read the marker level and record it in Table 1-28.

(28) Set the SG4 level as shown in the Input Signal Level column in Table 1-28 sequentially and repeat step (27) for each.

Table 1-28 Linear Scale Fidelity (X1)

Input Signal Level		Div. from Reference Level	△ Marker Level		
(dB, nominal)	(mV, nominal)		Min. (mV)	Actual (mV)	Max. (mV)
0 (Ref.)	223.6	0	223.6	223.6 (Ref.)	223.6
−0.92	201.24	1	167.7		234.8
−1.94	178.88	2	145.3		212.5
−3.10	156.52	3	122.9		190.1
−4.44	134.16	4	100.6		167.7
−6.02	111.8	5	78.2		145.4
−7.96	89.44	6	55.9		122.0
−10.46	67.08	7	33.5		100.7
−13.98	44.72	8	11.1		78.3

1.4.16 Input Attenuator Accuracy

- SPECIFICATION

Input attenuator accuracy (referenced to 10 dB input attenuation, for 20 to 70 dB settings):

R3465: 9 kHz to 8 GHz: < ±1.1 dB/10 dB step to a maximum of ±2.0 dB

R3272:
- 9 kHz to 12.4 GHz: < ±1.1 dB/10 dB step to a maximum of ±2.0 dB
- 12.4 GHz to 18 GHz: < ±1.3 dB/10 dB step to a maximum of ±2.5 dB
- 18 GHz to 26.5 GHz: < ±1.8 dB/10 dB step to a maximum of ±3.5 dB

R3263/3463: 9 kHz to 3 GHz: < ±1.1 dB/10 dB step to a maximum of ±2.0 dB

- RELATED ADJUSTMENT

There is no related adjustment procedure for this performance test.

- DESCRIPTION

This test measures the input attenuator's switching accuracy over the full 70 dB.
The number of frequency measured points is one point at 4 GHz for the R3465, one point at 1.5 GHz for the R3263/3463 and three points at 4 GHz, 15 GHz and 18 GHz for the R3272.
The synthesized sweeper is phase-locked to the spectrum analyzer's 10 MHz reference. The input attenuator switching accuracy is referenced to the 10 dB attenuator setting. Step-to-step accuracy is calculated from switching accuracy data.

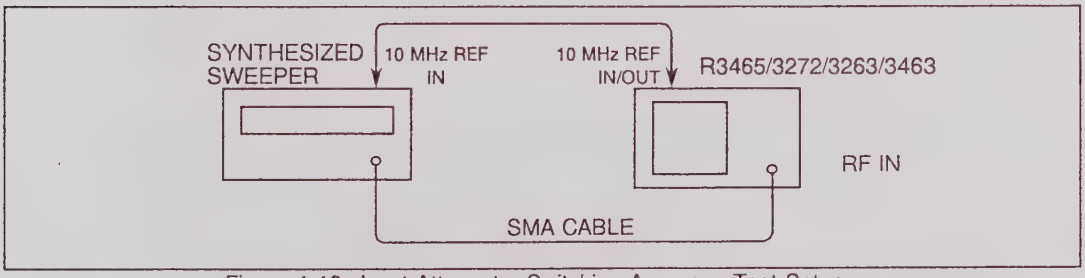

Figure 1-16 Input Attenuator Switching Accuracy Test Setup

- EQUIPMENT

Synthesized Sweeper (SG1)
Cables:
BNC, 150cm
SMA, 70cm

- PROCEDURE

(1) IF gain uncertainty is measured when the resolution bandwidth is set to 3kHz and the result is filled in on the IF Gain uncertainty of Table 1-29.
For the test method, refer to "1.4.14 IF Gain Uncertainty".

CAUTION

Measure IF gain uncertainty when the resolution bandwidth is set to 3 kHz before doing this test. IF gain uncertainty is included in the measurement result because of IF gain's changing and measuring in this test.

(2) Connect the equipment as shown in Figure 1-16.

(3) Set the SG1 controls as follows:

Frequency (for the R3465/3272)	4 GHz
(for the R3263/3463)	1.5 GHz
Amplitude	-5 dBm

(4) On the R3465/3272/3263/3463, press the SHIFT and PRESET keys and set the controls as follows:

Center Frequency (for the R3465/3272)	4 GHz
(for the R3263/3463)	1.5 GHz
Frequency Span	10 kHz
Ref Level	0 dBm
dB/div	1 dB/div
RBW	3 kHz
Trace Detector	Posi

(5) On the SG4, adjust the POWER LEVEL to the value 5 dB lower than the R3465/3272/3263/3463 reference level.

(6) On the R3465/3272/3263/3463, press the SINGLE key.

Press the SRCH key, read the MKR level and record it in Table 1-29 as the reference value.

(7) On the R3465/3272/3263/3463, press the ATT and ATT AUTO AUTO MNL keys to set the ATT AUTO to MNL.

(8) Press the key.

(9) On the R3465/3272/3263/3463, press the SINGLE key.

Press the SRCH key, read the MKR level. The marker level measured here is subtracted from the reference value measure in the (6).
IF gain uncertainty measured in the (1) is subtracted from the value.

Records it in Table 1-29 as Actual MKR Reading.

Actual MKR Reading	=	Reference value measured in the (6)	-	Marker level measured in the (9)	-	IF gain uncertainty measured in the (1)

(10) Repeat steps (7) through (9) for the remaining R3465/3272/3263/3463 ATT setting listed in Table 1-29.

(11) Calculate the step-to-step accuracy as described in the following steps and record the results in Table 1-29. Step-to-step accuracy should be within the limits shown in Table 1-29.

[Step-to-Step Accuracy Calculation]

(12) For the 20 dB ATT setting, switching accuracy becomes step-to-step accuracy.

(13) For the 30, 40, 50, 60 and 70 dB ATT settings, subtract the 10dB down ATT switching accuracy from the current ATT switching accuracy.

(14) Center Frequency is changed to 15GHz and 18GHz and the operations in (2) to (13) are executed for R3272. Fill in the value measured in the (1) when Center Frequency is 4GHz (1.5 GHz for the R3263/3463) on the IF Gain Uncertainty Table 1-29.

Table 1-29 Input Attenuator Accuracy

[R3465] Center Frequency: 4 GHz, Reference value____dBm

R3465 Attenuator (dB)	IF Gain (dB)	IF Gain Uncertainty (dB)	Switching Accuracy			Step-to-Step Accuracy	
			Min. (dB)	Actual (dB)	Max. (dB)	Actual (dB)	Spec. (dB)
10	0	0	0 (Ref.)	0 (Ref.)	0 (Ref.)	0 (Ref.)	0 (Ref.)
20	10		-2		+2		±1.1
30	20		-2		+2		±1.1
40	30		-2		+2		±1.1
50	40		-2		+2		±1.1
60	50		-2		+2		±1.1
70	60		-2		+2		±1.1

[R3272] Center Frequency: 4 GHz, Reference value____dBm

R3272 Attenuator (dB)	IF Gain (dB)	IF Gain Uncertainty (dB)	Switching Accuracy			Step-to-Step Accuracy	
			Min. (dB)	Actual (dB)	Max. (dB)	Actual (dB)	Spec. (dB)
10	0	0	0 (Ref.)	0 (Ref.)	0 (Ref.)	0 (Ref.)	0 (Ref.)
20	10		-2		+2		±1.1
30	20		-2		+2		±1.1
40	30		-2		+2		±1.1
50	40		-2		+2		±1.1
60	50		-2		+2		±1.1
70	60		-2		+2		±1.1

[R3272] Center Frequency: 15 GHz, Reference value____dBm

R3272 Attenuator (dB)	IF Gain (dB)	IF Gain Uncertainty (dB)	Switching Accuracy			Step-to-Step Accuracy	
			Min. (dB)	Actual (dB)	Max. (dB)	Actual (dB)	Spec. (dB)
10	0	0	0 (Ref.)	0 (Ref.)	0 (Ref.)	0 (Ref.)	0 (Ref.)
20	10		-2.5		+2.5		±1.3
30	20		-2.5		+2.5		±1.3
40	30		-2.5		+2.5		±1.3
50	40		-2.5		+2.5		±1.3
60	50		-2.5		+2.5		±1.3
70	60		-2.5		+2.5		±1.3

(cont'd)

[R3272] Center Frequency: 18 GHz, Reference value____dBm

R3272 Attenuator (dB)	IF Gain (dB)	IF Gain Uncertainty (dB)	Switching Accuracy			Step-to-Step Accuracy	
			Min. (dB)	Actual (dB)	Max. (dB)	Actual (dB)	Spec. (dB)
10	0	0	0 (Ref.)	0 (Ref.)	0 (Ref.)	0 (Ref.)	0 (Ref.)
20	10		-3.5		+3.5		±1.8
30	20		-3.5		+3.5		±1.8
40	30		-3.5		+3.5		±1.8
50	40		-3.5		+3.5		±1.8
60	50		-3.5		+3.5		±1.8
70	60		-3.5		+3.5		±1.8

[R3263/3463] Center Frequency: 1.5 GHz, Reference value____dBm

R3263/3463 Attenuator (dB)	IF Gain (dB)	IF Gain Uncertainty (dB)	Switching Accuracy			Step-to-Step Accuracy	
			Min. (dB)	Actual (dB)	Max. (dB)	Actual (dB)	Spec. (dB)
10	0	0	0 (Ref.)	0 (Ref.)	0 (Ref.)	0 (Ref.)	0 (Ref.)
20	10		-2		+2		±1.1
30	20		-2		+2		±1.1
40	30		-2		+2		±1.1
50	40		-2		+2		±1.1
60	50		-2		+2		±1.1
70	60		-2		+2		±1.1

1.4.17 Calibration Amplitude Accuracy

- SPECIFICATION

  Amplitude: – 10 dBm ± 0.3 dB

- RELATED ADJUSTMENT
  Calibration amplitude adjustment.

- DESCRIPTION
  The amplitude accuracy of the CALOUT signal are checked for – 10 dBm ± 0.3 dBm.

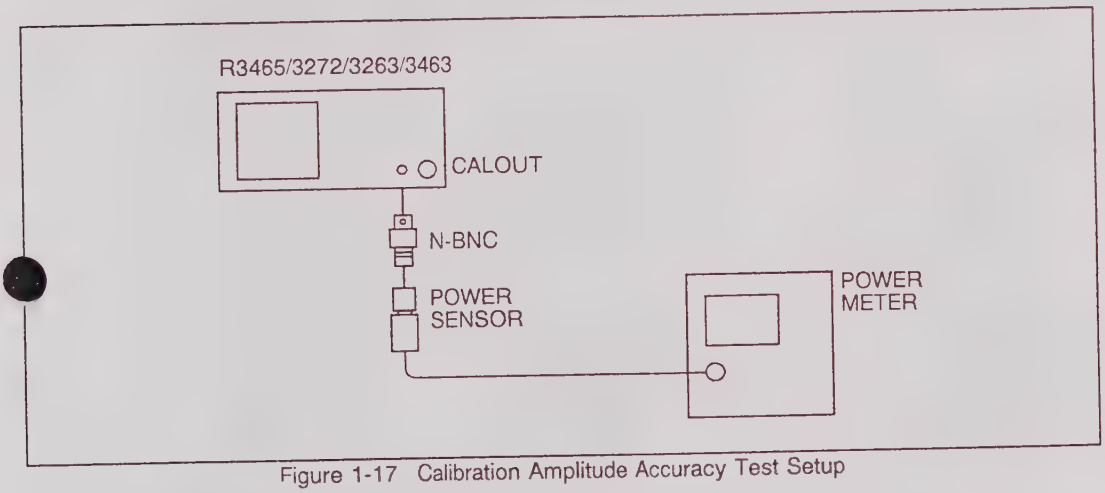

Figure 1-17 Calibration Amplitude Accuracy Test Setup

- EQUIPMENT

  Power Meter
  Power Sensor (Sensor 2)

- PROCEDURE

  (1) Connect the equipment as shown in Figure 1-17.

  (2) Press the power sensor zero of the power meter and calibrate the power sensor. Enter the power sensor's 30 MHz calibration factor into the power meter.

  (3) Connect the power sensor via an N(f) – BNC(m) adapter directly to the CALOUT connector. Read the power meter display. The power level should be within the following limits (± 0.3 dB):

  $$-10.3\ \text{dBm} \leq \underset{\text{Actual}}{_____} \leq -9.7\ \text{dBm}$$

1.5 Checklist/Data Form

File No. :_____ Description : SPECTRUM ANALYZER

UUT MFR : ADVANTEST CO. ID No. :_____

Model : R3465/3272/3263/3463 Date :_____

Table 1-30 Performance Test Record (1 of 11)

Para. No.	Test Description	Results		
		Min.	Actual	Max.
1	Frequency Readout Accuracy and Frequency Counter Marker Accuracy			
	1.5 GHz CENTER FREQ			
	1 MHz SPAN	1.499988 GHz		1.500012 GHz
	10 MHz SPAN	1.49958 GHz		1.50042 GHz
	50 MHz SPAN	1.49784 GHz		1.50216 GHz
	100 MHz SPAN	1.4958 GHz		1.4042 GHz
	2 GHz SPAN	1.419 GHz		1.581 GHz
	5.0 GHz CENTER FREQ			
	1 MHz SPAN	4.999987 GHz		5.000013 GHz
	10 MHz SPAN	4.99958 GHz		5.00042 GHz
	50 MHz SPAN	4.99784 GHz		5.00216 GHz
	100 MHz SPAN	4.9958 GHz		5.0042 GHz
	2 GHz SPAN	4.919 GHz		5.081 GHz
	<R3272 ONLY>			
	11.0 GHz CENTER FREQ			
	1 MHz SPAN	10.999987 GHz		11.000013 GHz
	10 MHz SPAN	10.99958 GHz		11.00042 GHz
	50 MHz SPAN	10.99784 GHz		11.00216 GHz
	100 MHz SPAN	10.9958 GHz		11.0042 GHz
	2 GHz SPAN	10.919 GHz		11.081 GHz
	18.0 GHz CENTER FREQ			
	1 MHz SPAN	17.999986 GHz		18.000014 GHz
	10 MHz SPAN	17.99958 GHz		18.00042 GHz
	50 MHz SPAN	17.99784 GHz		18.00216 GHz
	100 MHz SPAN	17.9958 GHz		18.0042 GHz
	2 GHz SPAN	17.919 GHz		18.081 GHz

Table 1-30 Performance Test Record (2 of 11)

Para. No.	Test Description	Results		
		Min.	Actual	Max.
1	Frequency Readout Accuracy and Marker Frequency Counter Accuracy (cont'd)			
	Marker Frequency Counter Accuracy			
	1.5 GHz CENTER FREQ	1.499999844 GHz		1.500000156 GHz
	5.0 GHz CENTER FREQ	4.999999494 GHz		5.000000506 GHz
	11.0 GHz CENTER FREQ	10.999998889 GHz		11.000001111 GHz
	18.0 GHz CENTER FREQ	17.999998184 GHz		18.000001816 GHz
2	Frequency Reference Output Accuracy			
	10 MHz Reference Frequency	29.9999970 MHz		30.0000030 MHz
3	Noise Sidebands			
	1.5 GHz Center Frequency			
	10 kHz Offset			−100 dBc/Hz
	100 kHz Offset			−110 dBc/Hz
	<R3465/3272 ONLY>			
	3.5 GHz Center Frequency			
	10 kHz Offset			−98 dBc/Hz
	100 kHz Offset			−108 dBc/Hz
4	Frequency Span Accuracy			
	1.5 GHz Center Frequency			
	5 MHz SPAN	3.96 MHz		4.04 MHz
	5.01 MHz SPAN	3.847 MHz		4.169 MHz
	40 MHz SPAN	30.72 MHz		33.28 MHz
	400 MHz SPAN	307.2 MHz		332.8 MHz
	<R3465/3272 ONLY>			
	4.0 GHz Center Frequency			
	4 GHz SPAN	3.072 GHz		3.328 GHz
	8 GHz SPAN	6.144 GHz		6.656 GHz
	<R3272 ONLY>			
	10 GHz Center Frequency			
	10 GHz SPAN	7.68 GHz		8.32 GHz
	19 GHz SPAN	15.36 GHz		16.64 GHz

Table 1-30 Performance Test Record (3 of 11)

Para. No.	Test Description	Results		
		Min.	Actual	Max.
5	Resolution Bandwidth Accuracy and Selectivity			
	Resolution Bandwidth Accuracy			
	5 MHz	3.50 MHz		6.5 MHz
	3 MHz	2.1 MHz		3.9 MHz
	1 MHz	800 kHz		1.2 MHz
	300 kHz	240 kHz		360 kHz
	100 kHz	80 kHz		120 kHz
	30 kHz	24 kHz		36 kHz
	10 kHz	8.0 kHz		12.0 kHz
	3 kHz	2.4 kHz		3.6 kHz
	1 kHz	800 Hz		1200 Hz
	300 Hz	210 Hz		390 Hz
	Resolution Bandwidth Selectivity			
	5 MHz			15
	3 MHz			15
	1 MHz			15
	300 kHz			15
	100 kHz			15
	30 kHz			15
	10 kHz			15
	3 kHz			15
	1 kHz			15
	300 Hz			15

Table 1-30 Performance Test Record (4 of 11)

Para. No.	Test Description	Results		
		Min.	Actual	Max.
6	Resolution Bandwidth Switching Uncertainty			
	3 MHz	−0.3 dB		+0.3 dB
	1 MHz	−0.3 dB		+0.3 dB
	300 kHz		0 (Ref)	
	100 kHz	−0.3 dB		+0.3 dB
	30 kHz	−0.3 dB		+0.3 dB
	10 kHz	−0.3 dB		+0.3 dB
	3 kHz	−0.3 dB		+0.3 dB
	1 kHz	−0.3 dB		+0.3 dB
	300 Hz	−0.3 dB		+0.3 dB

Table 1-30 Performance Test Record (5 of 11)

Para. No.	Test Description	Results		
		Min.	Actual	Max.
7	Displayed Average Noise Level			
	<R3465 ONLY>			
	10 kHz			−70.0 dBm
	100 kHz			−80.0 dBm
	1.1MHz			−114.99 dBm
	101 MHz			−114.84 dBm
	501 MHz			−114.22 dBm
	1001 MHz			−113.45 dBm
	1501 MHz			−112.67 dBm
	2001 MHz			−111.90 dBm
	2501 MHz			−111.12 dBm
	2999 MHz			−110.35 dBm
	1.7 GHz to 7.0 GHz			−115 dBm
	6.9 GHz to 8.0 GHz			−115 dBm
	<R3272 ONLY>			
	10 kHz			−70.0 dBm
	100 kHz			−80.0 dBm
	1.1MHz			−114.99 dBm
	101 MHz			−114.84 dBm
	501 MHz			−114.22 dBm
	1001 MHz			−113.45 dBm
	1501 Hz			−112.67 dBm
	2001 MHz			−111.90 dBm
	2501 MHz			−111.12 dBm
	2999 MHz			−110.35 dBm
	3.0 GHz to 7.5 GHz			−110.0 dBm
	7.4 GHz to 15.4 GHz			−103.0 dBm
	15.2 GHz to 23.3 GHz			−96.0 dBm
	23 GHz to 26.5 GHz			−90.0 dBm
	<R3263/3463 ONLY>			
	10 kHz			−70.0 dBm
	100 kHz			−80.0 dBm
	1.1 MHz			−114.99 dBm
	101 MHz			−114.84 dBm
	501 MHz			−114.22 dBm
	1001 MHz			−113.45 dBm
	1501 MHz			−112.67 dBm
	2001 MHz			−111.90 dBm
	2501 MHz			−111.12 dBm
	2999 MHz			−110.35 dBm

Table 1-30 Performance Test Record (6 of 11)

Para. No.	Test Description	Results		
		Min.	Actual	Max.
8	Gain Compression			
	820.5 MHz	−5 dBm		
	<R3465/3272 ONLY>			
	3200.5 MHz	−5 dBm		
9	Residual Response			
	1 MHz to 3.0 GHz			−100 dBm
	<R3465 ONLY>			
	1.7 GHz to 8.0 GHz			−90 dBm
	<R3272 ONLY>			
	3.0 GHz to 26.5 GHz			−90 dBm
10	Second Harmonic Distortion			
	INPUT FREQ: 1.4 GHz			−70 dBc
	INPUT FREQ: 1.9 GHz			−100 dBc
11	Third Order Intermodulation Distortion			(Mixer Input Level : -20dBm)
	820.005 MHz			−55 dBc
	3200.005 MHz			−55 dBc
12	Image, Multiple, and Out-of-Band Response			
	Maximum Response Amplitude			
	<R3465 ONLY>			
	10 MHz to 8 GHz			−70 dBc
	<R3272 ONLY>			
	10 MHz to 18 GHz			−70 dBc
	10 MHz to 23 GHz			−60 dBc
	10 MHz to 26.5 GHz			−50 dBc
	<R3263/3463 ONLY>			
	10 MHz to 3 GHz			−70 dBc

Table 1-30 Performance Test Record (7 of 11)

Para. No.	Test Description	Results		
		Min.	Actual	Max.
13	Frequency Response			
	<R3465 ONLY>			
	9 kHz to 3.0 GHz	−1.5 dB		+1.5 dB
	50 MHz to 3.0 GHz	−1.0 dB		+1.0 dB
	1.7 GHz to 7.5 GHz	−1.5 dB		+1.5 dB
	7.4 GHz to 8 GHz	−1.5 dB		+1.5 dB
	<R3272 ONLY>			
	9 kHz to 3.0 GHz	−1.5 dB		+1.5 dB
	50 MHz to 3.0 GHz	−1.0 dB		+1.0 dB
	3.0 GHz to 7.5 GHz	−1.5 dB		+1.5 dB
	7.4 GHz to 15.4 GHz	−3.5 dB		+3.5 dB
	15.4 GHz to 23.3 GHz	−4.0 dB		+4.0 dB
	23.0 GHz to 26.5 GHz	−4.0 dB		+4.0 dB
	<R3263/3463 ONLY>			
	9 kHz to 3.0 GHz	−1.5 dB		+1.5 dB
	50 MHz to 3.0 GHz	−1.0 dB		+1.0 dB
14	IF Gain Uncertainty			
	RBW 10 kHz REF LEVEL			
	0 dBm			
	−1 dBm	−0.5 dB		+0.5 dB
	−2 dBm	−0.5 dB		+0.5 dB
	−3 dBm	−0.5 dB		+0.5 dB
	−4 dBm	−0.5 dB		+0.5 dB
	−5 dBm	−0.5 dB		+0.5 dB
	−6 dBm	−0.5 dB		+0.5 dB
	−7 dBm	−0.5 dB		+0.5 dB
	−8 dBm	−0.5 dB		+0.5 dB
	−9 dBm	−0.5 dB		+0.5 dB
	−10 dBm	−0.5 dB		+0.5 dB
	−20 dBm	−0.5 dB		+0.5 dB
	−30 dBm	−0.5 dB		+0.5 dB
	−40 dBm	−0.5 dB		+0.5 dB
	−50 dBm	−0.5 dB		+0.5 dB

Table 1-30 Performance Test Record (8 of 11)

Para. No.	Test Description	Results		
		Min.	Actual	Max.
14	IF Gain Uncertainty (cont'd)			
	RBW 3 kHz REF LEVEL			
	0 dBm			
	−1 dBm	−0.5 dB		+0.5 dB
	−2 dBm	−0.5 dB		+0.5 dB
	−3 dBm	−0.5 dB		+0.5 dB
	−4 dBm	−0.5 dB		+0.5 dB
	−5 dBm	−0.5 dB		+0.5 dB
	−6 dBm	−0.5 dB		+0.5 dB
	−7 dBm	−0.5 dB		+0.5 dB
	−8 dBm	−0.5 dB		+0.5 dB
	−9 dBm	−0.5 dB		+0.5 dB
	−10 dBm	−0.5 dB		+0.5 dB
	−20 dBm	−0.5 dB		+0.5 dB
	−30 dBm	−0.5 dB		+0.5 dB
	−40 dBm	−0.5 dB		+0.5 dB
	−50 dBm	−0.5 dB		+0.5 dB

Table 1-30 Performance Test Record (9 of 11)

Para. No.	Test Description	Results		
		Min.	Actual	Max.
15	Scale Fidelity			
	1 dB/div Log Scale Fidelity			
	−1 dB	−0.2 dB		+0.2 dB
	−2 dB	−0.4 dB		+0.4 dB
	−3 dB	−0.6 dB		+0.6 dB
	−4 dB	−0.8 dB		+0.8 dB
	−5 dB	−1.0 dB		+1.0 dB
	−6 dB	−1.2 dB		+1.2 dB
	−7 dB	−1.4 dB		+1.4 dB
	−8 dB	−1.5 dB		+1.5 dB
	−9 dB	−1.5 dB		+1.5 dB
	−10 dB	−1.5 dB		+1.5 dB
	10 dB/div Log Scale Fidelity			
	−10 dB	−1.0 dB		+1.0 dB
	−20 dB	−1.5 dB		+1.5 dB
	−30 dB	−1.5 dB		+1.5 dB
	−40 dB	−1.5 dB		+1.5 dB
	−50 dB	−1.5 dB		+1.5 dB
	−60 dB	−1.5 dB		+1.5 dB
	−70 dB	−1.5 dB		+1.5 dB
	−80 dB	−1.5 dB		+1.5 dB
	Linear Scale Fidelity			
	div from Ref Level			
	1	167.7 mV		234.8 mV
	2	145.3 mV		212.5 mV
	3	122.9 mV		190.1 mV
	4	100.6 mV		167.7 mV
	5	78.2 mV		145.4 mV
	6	55.9 mV		122.0 mV
	7	33.5 mV		100.7 mV
	8	11.1 mV		78.3 mV

Table 1-30 Performance Test Record (10 of 11)

Para. No.	Test Description	Results		
		Min.	Actual	Max.
16	Input Attenuator Accuracy			
	<R3465/3272 ONLY>			
	(4 GHz Center Freq)			
	Switching Accuracy			
	20 dB	-2 dB		+2 dB
	30 dB	-2 dB		+2 dB
	40 dB	-2 dB		+2 dB
	50 dB	-2 dB		+2 dB
	60 dB	-2 dB		+2 dB
	70 dB	-2 dB		+2 dB
	Step-to-Step Accuracy			
	20 dB	−1.1 dB		+1.1 dB
	30 dB	−1.1 dB		+1.1 dB
	40 dB	−1.1 dB		+1.1 dB
	50 dB	−1.1 dB		+1.1 dB
	60 dB	−1.1 dB		+1.1 dB
	70 dB	−1.1 dB		+1.1 dB
	<R3272 ONLY>			
	(15 GHz Center Freq)			
	Switching Accuracy			
	20 dB	-2.5 dB		+2.5 dB
	30 dB	-2.5 dB		+2.5 dB
	40 dB	-2.5 dB		+2.5 dB
	50 dB	-2.5 dB		+2.5 dB
	60 dB	-2.5 dB		+2.5 dB
	70 dB	-2.5 dB		+2.5 dB
	Step-to-Step Accuracy			
	20 dB	−1.3 dB		+1.3 dB
	30 dB	−1.3 dB		+1.3 dB
	40 dB	−1.3 dB		+1.3 dB
	50 dB	−1.3 dB		+1.3 dB
	60 dB	−1.3 dB		+1.3 dB
	70 dB	−1.3 dB		+1.3 dB
	(18 GHz Center Freq)			
	Switching Accuracy			
	20 dB	-3.5 dB		+3.5 dB
	30 dB	-3.5 dB		+3.5 dB
	40 dB	-3.5 dB		+3.5 dB
	50 dB	-3.5 dB		+3.5 dB
	60 dB	-3.5 dB		+3.5 dB
	70 dB	-3.5 dB		+3.5 dB

Table 1-30 Performance Test Record (11 of 11)

Para. No.	Test Description	Results		
		Min.	Actual	Max.
16	Input Attenuator Accuracy (cont'd)			
	<R3272 ONLY>			
	Step-to-Step Accuracy			
	20 dB	−1.8 dB		+1.8 dB
	30 dB	−1.8 dB		+1.8 dB
	40 dB	−1.8 dB		+1.8 dB
	50 dB	−1.8 dB		+1.8 dB
	60 dB	−1.8 dB		+1.8 dB
	70 dB	−1.8 dB		+1.8 dB
	<R3263/3463 ONLY>			
	(1.5 GHz Center Freq)			
	Switching Accuracy			
	20 dB	-2 dB		+2 dB
	30 dB	-2 dB		+2 dB
	40 dB	-2 dB		+2 dB
	50 dB	-2 dB		+2 dB
	60 dB	-2 dB		+2 dB
	70 dB	-2 dB		+2 dB
	Step-to-Step Accuracy			
	20 dB	−1.1 dB		+1.1 dB
	30 dB	−1.1 dB		+1.1 dB
	40 dB	−1.1 dB		+1.1 dB
	50 dB	−1.1 dB		+1.1 dB
	60 dB	−1.1 dB		+1.1 dB
	70 dB	−1.1 dB		+1.1 dB
17	Calibration Amplitude Accuracy	−10.3 dBm		−9.7 dBm

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